MIDWESTERN BUSINESS AND ECONOMIC REVIEW

Number 49
Spring 2014

In This Issue…

MIDWESTERN STATE UNIVERSITY

BBGR

Bureau of Business and Government Research
Midwestern State University
Wichita Falls, Texas

MIDWESTERN
STATE UNIVERSITY

Midwestern State University
Wichita Falls, Texas
http://www.mwsu.edu

Please direct all comments to:

Editor:
Midwestern Business
and Economic Review

Bureau of Business and
Government Research

Dillard College of
Business Administration

Midwestern State University
3410 Taft Boulevard
Wichita Falls, Texas 76308-2099

Telephone: (940) 397-4360
Fax: (940) 397-4693

MIDWESTERN BUSINESS AND ECONOMIC REVIEW

The *Midwestern Business and Economic Review* is published twice a year, in the fall and spring, by the Bureau of Business and Government Research. The articles published present the points of view of the individual authors and do not necessarily reflect those of the Bureau of Business and Government Research, the Dillard College of Business Administration, or Midwestern State University. The authors assume responsibility for the accuracy of facts published in the articles.

The *Midwestern Business and Economic Review* invites submission of original manuscripts and research by individuals in the public and private sector in the areas of economics and business administration. Of particular interest are topics dealing with issues relevant to Texas and the Southwestern United States. Submission requirements may be found inside the back cover.

Additional copies of this issue are available upon request for $5.00.

MIDWESTERN BUSINESS AND ECONOMIC REVIEW

No. 49 ..... Spring 2014

Table of Contents

ABSTRACTS

MALAYSIAN NARROWLY DEFINED MONEY SUPPLY AND EQUITY PRICE BEHAVIOR: AN ECONOMETRIC ANALYSIS

The asymmetric cointegration relationship between the monthly percentage changes in the Malaysian equity price index and in the narrowly defined money supply M1 is documented. These results suggest that Malaysian equity investors react to countercyclical monetary policy differently in different phases of the business cycles in both the short run and the long run. The empirical findings are likely attributable to the influences of Islamic finance, which causes the market force to eliminate excessive returns faster than it does earning deficiencies on equity investment. These empirical results also reveal a bi-directional Granger causality which suggests the existence of both the neoclassical and the post-Keynesian positions in the equity market.

LEARNING FROM FOLLOWERS: LEADERSHIP BEHAVIORS LINKED TO MEMBERS' EXTRA EFFORT IN SMALL, FAST-FORMING, SHORT-DURATION TEAMS

Organizations utilize small, fast-forming, short-duration teams in the forms of project teams, committees, task forces, etc. Using this unique type of team construct, this study gathered data from the perspective of team members and utilized a quantitative, correlational/linear regression approach using the MLQ-5x questionnaire to determine specific leadership behaviors predicting levels of members' extra effort. The study, using followers' perspectives, contributes to research and leadership practitioner development in these small, fast-forming, short-duration teams.

PROPERTY CRIME AND TOP INCOME SHARES: NEW EVIDENCE FROM A PANEL OF STATES

This paper examines the empirical relationship between property crime and top income shares using a new, comprehensive panel of annual state-level inequality measures over the period 1960 to 2004. Since the number of time series observations in our panel is relatively large and of the same order of magnitude as the number of groups, we are able to explore the crime/inequality relationship through a variety of dynamic panel estimation techniques. Our findings indicate that the concentration of income in the upper-end of the income distribution is negatively associated with several alternative property crime rate measures.

RE-EXAMINING FELDSTEIN-HORIOKA FOR THE NAFTA COUNTRIES: A TIME SEGMENTED PANEL COINTEGRATION APPROACH

The Feldstein-Horioka hypothesis states that a high positive correlation between domestic investment (I) and domestic saving (S) would imply low international capital mobility. But the literature is far from unanimous on this topic, and so we wanted to revisit this controversy with a statistically more powerful econometric technique. In this study we concentrate on the NAFTA (USA, Canada and Mexico) economies, in a time segmented pre and post NAFTA approach. The evidence indicates that the ratios are cointegrated for these countries, implying that there is very little capital mobility between these countries and domestic investment is primarily funded by domestic savings.

THE ECONOMIC IMPACT OF A SMALL UNIVERSITY AND ITS ATHLETIC PROGRAM ON THE REGIONAL ECONOMY: A CASE STUDY

A university plays an important economic role in the regional economic growth. This documents the economic impact of Midwestern State University, a regional state university, and its athletic program on the regional economy. The estimates are that the university has over-all economic impact accounting for 6.2 percent of the total regional product of the Wichita Falls MSA and its athletic programs accounts for 13.7 percent of the university total economic impact.

MALAYSIAN NARROWLY DEFINED MONEY SUPPLY AND EQUITY PRICE BEHAVIOR: AN ECONOMETRIC ANALYSIS

Chu V. Nguyen, University of Houston – Downtown
Charles Smith, University of Houston – Downtown
Steve Caples, McNeese State University,
Mike Hanna, University of Houston – Clear Lake

INTRODUCTION

The standard neoclassical paradigm of financial economics assumes that investors react to noteworthy news events by adjusting their investment portfolios because these events change the risk-return profile of securities. Therefore, changes in the narrowly defined money supply M1 are indicators of changes in future macroeconomic conditions such as inflation, interest rates and unemployment; sophisticated and unsophisticated investors alike will react by repositioning their portfolios. More specifically, neoclassical economists theorized that an increase in the narrowly defined money supply strengthens stock prices. Conversely, a fall in this category of money supply should slow down stock prices.

Based on its view that individuals allocate their wealth between narrowly defined money and other financial assets (Froyen 2009, p. 100), the post-Keynesian school of economics questioned the directional causality of the above hypothesized relationship. This school of thought posits that movements in money supply M1 reflect the shift of money from liquidating other assets to transaction deposits and vice versa as a result of the preceding changes in stock prices. For example, rises in equity prices induce investors to liquidate their other assets to use the fund to purchase stocks and other financial assets. In this portfolio adjustment process, transaction deposits tend to increase, which in turn raises the category of narrowly defined money supply. The trend is reversed when assets and stock prices are falling. As a result of this, some post-Keynesian economists argue that changes in stock prices actually cause changes in money supply M1 and not the reverse.

Additionally, the asymmetries in the context of returns on financial market instruments have been studied extensively and documented in the literature of the indirect financing segment of the financial industry. Arak et al. (1983), Goldberg (1984), Forbes and Mayne (1989), Levine and Loeb (1989), Mester and Saunders (1995), Dueker (2000), and Tkacz (2001) report asymmetries in the U.S. prime lending rate. Thompson (2006) confirms asymmetries in the US prime lending-deposit rate spread. Cook and Hahn (1989), Moazzami (1999), and Sarno and Thornton (2003) find asymmetries in U.S. Treasury securities. Frost and Bowden (1999) and Scholnick (1999) report asymmetries in mortgage rates in New Zealand and Canada. Heffernan (1997) and Hofmann and Mizen (2004) indicate asymmetric behavior of retail rates in the United Kingdom. Nguyen et al. (2010) document the asymmetric cointegration relationship between U.S. stock prices and the money supply M1. Hannan and Berger (1991), and Neumark and Sharpe (1992), Diebold and Sharpe (1992) examine various deposit rates.

The rationale for theoretically hypothesizing the asymmetric adjustment process of stock prices to the long-run equilibrium in a market economy can be attributed to the seemingly opposite effects of the efficient market hypothesis and the countercyclical monetary policy over different phases of business cycles. For instance, during the contractionary phases of business cycles, countercyclical monetary policy would usually increase the money supply thereby reducing market interest rates, while the information from that state of the economy would precipitate investors to resist adjusting their required risk premium on the stock market portfolio downward because of their perceived increase in market portfolio risk. Thus, the stock prices only increase slowly. By the same logic, it may be argued that, during the late stage of expansionary phases of business cycles, investors are less likely to resist adjusting their required risk premium on the stock market portfolio downward while monetary authority is expected to reduce the growth in the money supply, raising market interest rates. Therefore, equity prices are more likely to react to monetary policy actions asymmetrically over different phases of business cycles.

MALAYSIAN INSTITUTIONAL ARRANGEMENTS

Since its independence, the most important socioeconomic issue in Malaysia has been the economic standing of ethnic Malays and other indigenous people, collectively known as "bumiputras." In an effort to eradicate poverty and to end the identification of economic function with ethnicity, the Malaysian government established the national economic policy known as the New Economic Policy (NEP) in 1971. Rapid economic growth through the mid-90s allowed the government to expand the share of the economy for bumiputras without reducing the economic welfare of other groups. The controversy of the NEP was that the government provided funds to purchase foreign-owned shareholdings for the bumiputras population. This in turn changed the pattern of ownership of corporate equity in Malaysia. Additionally, in June 1991, after the NEP expired, the government unveiled its National Development Policy, which contained many of the NEP's goals, although without specific equity targets and timetables (Malaysia Country Study 2007, Guide International Business Publication, USA, and Washington DC, USA-Malaysia).

As to the equity market trading arrangements, Bursa Malaysia Berhad is Malaysia's current stock exchange which has a

history dating back to 1930, when the Singapore Stock brokers' Association was established as a formal organization to deal in securities. The Malaysian Stock Exchange was established in 1960 for the public to trade shares. The Stock Exchange of Malaysia was formally established in 1964. This exchange was renamed the Stock Exchange of Malaysia and Singapore in 1965. When the currency interchangeability between Malaysia and Singapore ceased in 1973, the Stock Exchange of Malaysia and Singapore was divided to form the Kuala Lumpur Stock Exchange Berhad and the Stock Exchange of Singapore. The Kuala Lumpur Stock Exchange was established and assumed the operations of the Kuala Lumpur Stock Exchange Berhad. Finally, on April 14, 2004, the Kuala Lumpur Stock Exchange was renamed Bursa Malaysia Berhad. On December 31, 2009, the market capitalization of Bursa Malaysia was 999 billion Malaysian ringgits (RM) or US $ 299 billion (exchange history, retrieved May 20, 2010 from www.bursamalaysia.com).

Additionally, one of the central objectives for Malaysian policymakers since the early 1980s has been the development of Islamic financial industry and institutions. To this end, the government has established regulatory and tax systems to support the market-driven environment in which Islamic finance coexists with conventional finance. As a result, Malaysia currently has robust Islamic and conventional financial systems that operate parallel to each other. Islamic finance has grown rapidly. As pointed out in the recent IMF Country Report on Malaysia, the assets of Islamic banks have doubled since 2000, accounting for about 17 percent of total banking sector assets as of May 2009. Shariah-compliant stocks account for about 88 percent of stocks listed and for 64 percent of total market capitalization of the Malaysian stock market. *Takaful* (Islamic insurance) operators have a 7 percent share of total insurance and *takaful* assets, and about 13 percent of funds managed by unit trust management companies are Islamic (IMF Country Report No. 09/253, 2009, p. 14). The central feature of the Islamic financial operation is that Shariah, the Islamic laws, prohibits the payment or acceptance of a fixed or predetermined rate of interest, known as *riba*.

Malaysia has become one of the largest, if not the largest, international Islamic financial centers. Malaysia hosts the world's largest *sukuk* (Islamic bonds) market (estimated at RM 155 billion, or 59 percent of total outstanding bonds in Malaysia). As of the end of 2008, Malaysian *sukuk* accounted for about 61 percent of the total global *sukuk* outstanding (both domestic and international issues). In 2008, Malaysia also led in terms of global *sukuk* issuance with a share of 53 percent, followed by the United Arab Emirates, Saudi Arabia, and Bahrain. The current global crisis has more than halved the global issuance of *sukuk* in 2008 (54 percent decline year to year), but medium-term prospects remain positive. The share of ringgit-denominated issuance declined to one-third of total global issuance in 2008 from about 78 percent in the previous year, while other currencies, such as the Emirati dirham and the Saudi riyal, experienced increases. In other sectors of Islamic finance, international Islamic stock indices have been developed and new licenses issued to foreign Islamic banks, Islamic fund management companies, and *takaful* (IMF Country Report No. 09/253, 2009, p. 14).

The above mentioned institutional arrangements in the financial sector render the Malaysian economy unique in different aspects, compared with economies of developing or industrialized countries. As a consequence of extensive governmental interventions to eradicate poverty and end the identification of economic function with ethnicity, the pattern of ownership of corporate equity in Malaysia has been biased toward the bumiputras population. Secondly, also through the concerted efforts of the government, Malaysia now has robust Islamic and conventional financial systems that operate parallel to each other. Since shariah prohibits the payment or acceptance of interest fees, the "normal" market economic concept of the relationship between lending rates and deposit rates or cost of funds is surely distorted. Stock ownership, representing the concept of partnership - i.e., sharing the risk - therefore does not violate Shariah.

The aforementioned unique and complex characteristics of the Malaysian financial system create enormous intellectual curiosity and lead to questions as to how the returns on its market equity portfolio respond to the national countercyclical monetary policy actions. To formally investigate this matter, this study utilizes Enders and Siklos (2001) procedure to test for asymmetric co-integrating relationship and Granger causality between the Malaysian share prices and the monthly money supply M1. The remainder of this paper is organized as follows: The next section describes the data for this study; the following section briefly describes the methodology that will be used in the investigation; the next section reports the empirical test results for co-integration allowing for asymmetric adjustment to a threshold; the section that follows presents the results of the cointegration and asymmetry tests; the next section examines the results of the asymmetric error-correction model to determine the Granger causality between the stock prices and money supply M1; and the final section provides some concluding remarks.

THE DATA

This study uses data on the Malaysian monthly money supply M1 (line 59ma) and share price index (line 62) as a proxy for the market stock price index from International Financial Statistics, published by the IMF, over the period 1985:2 to 2010:07. The monthly share price index and the money supply are expressed in monthly percentage changes. Monthly percentage changes in the share price index, which are used as a proxy measure for the returns on the market equity portfolio, and monthly percentage changes in the monthly money supply are denoted by SP_t and MS_t respectively. Throughout this study, SP_t and MS_t are referred to as share prices and the money supply.

Figure 1 displays the behavior of the returns on the share price index and monthly percentage changes in money supply M1 over the sample period. The descriptive statistics reveal that the monthly percentage change in money supply M1 mean during the sample period was 0.1153 percent, and ranged from -1.2874 percent to 1.3921 percent, with the standard deviation equal to 0.3858 percent, while the mean monthly percentage change in share prices was 0.0834 percent, and ranged from -3.6890 percent to 3.4409 percent, with the standard deviation

equal to 0.7899 percent. Moreover, given a level of the share price index, a decrease in the monthly money supply M1 would widen the spread between the monthly percentage changes in share price index and in the monthly money supply M1. The opposite is true if the money supply M1 changes in the other direction.

METHODOLOGY

An important implicit assumption of the Dickey-Fuller standard unit root tests and their extension is that the adjustment process is symmetric. If the adjustment process is asymmetric, then the implicitly assumed restrictive symmetric adjustment is indicative of model misspecification. To discern the possibility of asymmetric adjustment process, the threshold autoregressive (TAR) model and the momentum-threshold autoregressive (M-TAR) model developed by Enders and Siklos (2001) are estimated to formally examine the behavior of the relationship between the Malaysian M1 money supply and the equity price index. In this type of model specifications, the *difference* or the *spread* between two time series being investigated for possible cointegration is the "basis," a term coined by Ewing et al. (2006, p. 12) and often used in asymmetries analysis literature. Following this terminology, throughout this empirical investigation, the spread between the percentage changes in the returns on Malaysia's share price index or market equity portfolio and its narrowest money supply M1 is defined as the basis.

The threshold autoregressive (TAR) model allows the degree of autoregressive decay to depend on the state of the above defined basis in the previous period, i.e., the "deepness" of cycles. For instance, if the autoregressive decay is fast when the spread or the basis is above the trend and slow when the spread is below the trend, troughs will be more persistent than peaks. Likewise, if the autoregressive decay is slow when the spread is above trend and fast when the spread is below trend, peaks will be more persistent than troughs.

The momentum-threshold autoregressive (M-TAR) model allows changes in spread to display differing amounts of autoregressive decay depending on whether the change in the above defined basis in the previous period is increasing or decreasing. Thus, the M-TAR model captures the possibility of asymmetrically "sharp" movements in the changes of the equity returns and money supply M1. Enders and Siklos (2001) extended the popular two-step symmetric Engle and Granger (1987) methodology to test for long-run relationships between two time series allowing for asymmetry. Enders and Siklos (2001) also argued that the distinction with respect to asymmetries is important given that standard cointegration tests have low power in the presence of an asymmetric adjustment process (see Ewing et al. 2006, p. 15). The M-TAR model is especially valuable when the ad¬justment is believed to exhibit more momentum in one direction than the other. In these models' specifications, the null hypothesis that the basis contains a unit root can be expressed as $\rho_1 = \rho_2 = 0$, while the hypothesis that the spread is stationary with symmetric adjustments can be stated as $\rho_1 = \rho_2$.

As aforementioned, the Malaysian economy and its financial sector have gone through many changes and experienced many economic shocks, including the Asian financial crisis. Therefore, it is likely that the percentage changes in money supply M1 and in the equity index might experience structural break over the sample period. To avoid possible misspecification of equation (1) due to failure to account for structural shifts and hence the entire model, following the Perron's (1997) procedure, this study specified and estimated an endogenous unit root test function with the intercept, slope, and trend dummies to test the hypothesis that percentage changes in the Malaysian share price index and in the monthly money supply M1 have experienced structural breaks over the sample period. The results of these tests suggest that percentage changes in the Malaysian stock price index experienced a structural break in August 1998; however, the percentage changes in money supply did not exhibit any structural shifts in the sample period.

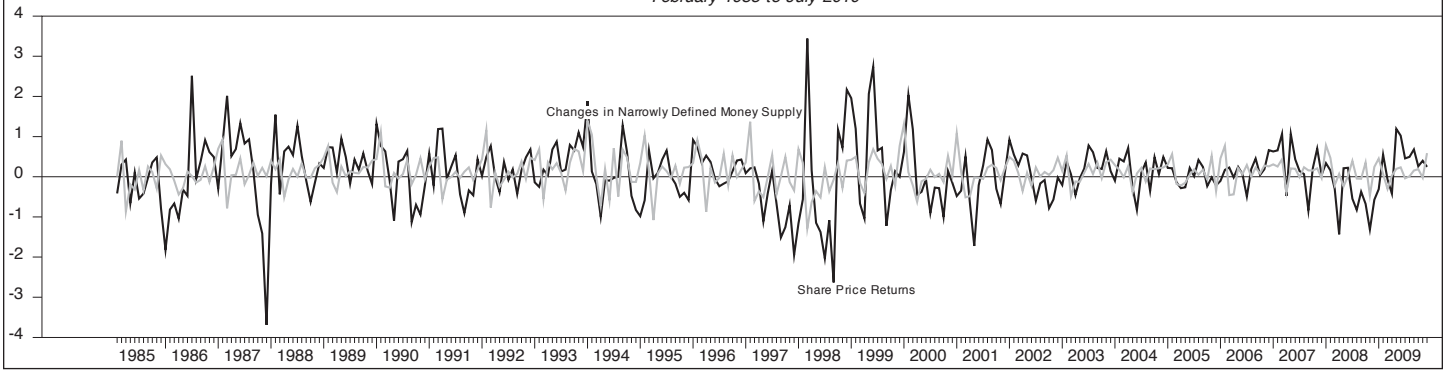
Given the above structural break test results, the first step in the Enders-Siklos (2001) procedure to formally investigate the cointegrating behavior of the Malaysian share prices and money supply M1 is to estimate the following long-run relationship between returns on the share price index and percentage changes in the narrowly defined money supply using ordinary least squares:

$$SP_t = \beta_0 + \beta_1 MS_t + \beta_2 Dummy_t + \beta_3 Trend_t + \varepsilon_t \qquad (1)$$

Figure 1

Malaysian Share Price Returns and Changes in Narrowly Defined Money Supply

February 1985 to July 2010



where SP_t and MS_t are the monthly percentage changes in the Malaysian share price index and in the monthly money supply M1, respectively. $Trend_t$ is a time trend and $Dummy_t$ is a dummy (with values of zero prior to August 1998 and values of one for August 1998 and thereafter). The saved residuals, ε_t from the estimation of equation (1), denoted by $\hat{\varepsilon}_t$, are then used to estimate the following TAR model:

$$\Delta\hat{\varepsilon}_t = I_t\rho_1\hat{\varepsilon}_{t-1} + (1-I_t)\rho_2\hat{\varepsilon}_{t-1} + \sum_{i=1}^{p}\alpha_i\Delta\hat{\varepsilon}_{t-p} + \hat{u}_t \qquad (2)$$

where $\hat{u}_t \sim i.i.d.(0,\sigma^2)$, and the lagged values of $\Delta\hat{\varepsilon}_t$ are meant to yield uncorrelated residuals. As defined by Enders and Granger (1998), the Heaviside indicator function for the TAR specification is given as:

$$I_t = \begin{cases} 1 & if\ \hat{\varepsilon}_{t-1} \geq \tau \\ 0 & if\ \hat{\varepsilon}_{t-1} < \tau \end{cases} \qquad (3)$$

while indicator function for the M-TAR specification is stated as:

$$I_t = \begin{cases} 1 & if\ \Delta\hat{\varepsilon}_{t-1} \geq \tau \\ 0 & if\ \Delta\hat{\varepsilon}_{t-1} < \tau \end{cases} \qquad (4)$$

The threshold value, τ, is endogenously determined using the Chan's (1993) procedure, which obtains τ by minimizing the sum of squared residuals after sorting the estimated residuals in ascending order, and eliminating 15 percent of the largest and smallest values. The elimination of the largest and the smallest values is to assure that the $\hat{\varepsilon}_t$ series crosses through the threshold in the sample period. Throughout this study, the included lags are selected by the statistical significance of their estimated coefficients as determined by the *t-statistics*. The model selection for further empirical investigation is based on their fitness to the data as measured by the Akaike's information criterion (aic) and Schwarz information criteria (sic) from the empirical estimations.

RESULTS OF THE COINTEGRATION TEST WITH ASYMMETRIC ADJUSTMENT

This section empirically examines whether or not the monthly percentage changes in the Malaysian share price index and in the monthly money supply M1 are co-integrated when allowing for asymmetric adjustments. Specifically, equation (1) is estimated using the SP_t and the MS_t series. The residuals from these estimations are used to estimate the TAR model specified by equations (2) and (3), and the M-TAR model, specified by equations (2) and (4). The estimation results for the TAR model and M-TAR model are reported in Table 1.

In regard to the TAR model, specified by equations (2) and (3), an analysis of the overall estimation results indicates that the estimation results are devoid of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall *F-statistics,* respectively. The calculated statistic Φ_μ = 57.2762 indicates that the null hypothesis of no cointegration, $\rho_1 = \rho_2 = 0$, should be rejected at the 1 percent significance level, indicating that the basis—the difference between the monthly percentage changes in the Malaysian share price index and in the monthly money supply M1— is stationary. With regard to the stationarity of the basis, Ewing et al. (2006, p. 14) pointed out that this simple finding of stationarity is consistent with the two underlying series comprising the basis (the monthly percentage changes of the Malaysian share price index and the money supply M1) being co-integrated in the *conventional, linear combination sense.*

The estimation results further reveal that both ρ_1 and ρ_2 are statistically significant at 1 percent level. In fact, the point estimates suggest that the basis tends to decay at the rate of $|\rho_1| = 0.8154$ for $\hat{\varepsilon}_{t-1}$ above the threshold, $\tau = -0.6693$, and at the rate of $|\rho_2| = 1.0922$ for $\hat{\varepsilon}_{t-1}$ below the threshold. However, the empirical results also reveal that the null hypothesis of symmetry, $\rho_1 = \rho_2$, cannot be rejected at any conventional significant level, based on the partial *F = 1.9802,* indicating statistically that adjustments around the threshold value of the basis—the spread between the percentage changes in the returns on Malaysian market equity portfolio and its narrowest money supply M1—are symmetric.

As to the M-TAR model, specified by equations (2) and (4); overall, the estimation results are also devoid of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall *F-statistics,* respectively. The calculated statistic Φ_μ = 45.9700 indicates that the

Table 1: Unit Root and Tests of Asymmetry, Malaysian Monthly Data, 1985:02 to 2010:07

Model	ρ_1	ρ_2	τ	$H_0: \rho_1 = \rho_2 = 0$	$H_0: \rho_1 = \rho_2$	aic	sic
TAR	-0.8154*	-1.0922*	-0.6693	Φ_μ = 57.2762*	$F_{(1,292)}$= 1.9802[0.1604]	0.0220	*0.0159*
	$Q_{(8)}$=8.4280 [0.3929]			*ln L = -319.0885*	$F_{(4,292)}$= 40.4457*		
M-TAR	-0.5976*	-0.2850*	-0.7573	Φ_μ = 45.9700*	$F_{(1,292)}$= 8.9519[0.0035]	0.0211	*0.0147*
	$Q_{(8)}$=4.9180[0.7663]			*ln L = -266.1504*	$F_{(4,292)}$=89.0346*		

Notes: *The null hypothesis of a unit root, $H_0: \rho_1 = \rho_2 = 0$, uses the critical values from Enders (2001, p. 259, Table 2, for four lagged changes and n = 100). * indicates 1% level of significance. The null hypothesis of symmetry, $H_0: \rho_1 = \rho_2$, uses the standard F distribution. τ is the threshold value determined via the Chan (1993) method. $Q_{(8)}$ denotes the Ljung-Box Q-statistic with 8 lags.*

null hypothesis of no cointegration, $\rho_1 = \rho_2 = 0$, should be rejected at the 1 percent significance level, confirming that the basis is stationary. Again, according to Ewing et al. (2006, p. 14), this simple finding of stationarity is consistent with the two underlying series comprising the basis being co-integrated in the *conventional, linear combination sense*.

In regards to the question of asymmetry, the empirical results reveal that, based on the partial *F = 8.9519*, the null hypothesis of symmetry, $\rho_1 = \rho_2$, should also be rejected at any conventional significant level, indicating statistically that adjustments around the threshold value of the basis are asymmetric. The estimation results reveal that both ρ_1 and ρ_2 are statistically significant at 1 percent level. The point estimates suggest that the basis tends to decay at the rate of $|\rho_1| = 0.5976$ for $\Delta\hat{\varepsilon}_{t-1}$ above the threshold, $\tau = -0.7573$, and at the rate of $|\rho_2| = 0.2850$ for $\Delta\hat{\varepsilon}_{t-1}$ below the threshold. Finally, Akaike's information criterion (aic) and Schwarz information criteria (sic) indicate that the M-TAR model fits the sample data better than the TAR model. Therefore, the M-TAR model's specification will be utilized for further investigation in this study.

Additionally, as aforementioned, the finding of $|\rho_1| > |\rho_2|$ indicates the basis converts to the threshold $\tau = -0.7573$ faster when $\Delta\hat{\varepsilon}_{t-1}$ is above the threshold than when it is below the threshold. These findings are indicative that the basis converts to the threshold $\tau = -0.7573$ faster when a decline in the monthly percentage change in money supply (signaling tight monetary policy) has widened the difference between the monthly percentage changes in the Malaysian share price index and in the monthly money supply M1—t*he basis or the spread*—than when there is an increase in money supply M1. This widening of their basis initiates a downward adjustment in the spread. This finding implies that the basis adjusts faster to the threshold value when the Malaysian monetary authority tightens the monthly money supply, widening the above basis, than when the authority eases the monetary policy, narrowing the basis. These findings suggest that the spread is more responsive to contractionary monetary policy as reflected in the decrease in the monthly money supply M1. These results can also be interpreted to indicate that Malaysian equity market investors respond to countercyclical monetary policy differently in different phases of the business cycles. These empirical results further reveal that the Malaysian capital market forces eliminate excessive returns on equity investment faster than they correct the earning deficiencies. Further, these empirical findings contradict reports by Nguyen et al. (2010) with respect to the weekly percentage changes in the US S&P 500 stock price index and weekly announced money supply M1, and are most likely the result of the influence of Islamic finance in the equity market.

RESULTS OF THE ASYMMETRIC ERROR-CORRECTION MODEL

The positive results of the above asymmetric cointegration tests as well as the aic and the sic that came from estimating the above TAR and M-TAR models necessitate the use of an M-TAR VEC model to further investigate the asymmetric dynamic behavior between the equity price index and the monthly money supply M1. The estimation results of this model can be used to study the nature of the Granger causality between the monthly percentage changes in the equity price index and in the monthly money supply M1. The empirically determined nature of the Granger causality will help to empirically determine the possible existence of the neoclassical and post-Keynesian hypothesized relationship between monthly percentage changes in the equity price index and monthly percentage changes in money supply in the Malaysian stock market. The findings can also be used to analyze the Malaysian equity index and hence whether the equity investors dynamically respond to countercyclical monetary policy in the short run. Additionally as aforementioned, the following M-TAR VEC model differs from the conventional error-correction models by allowing asymmetric adjustments toward the long-run equilibrium.

$$\Delta SP_t = \alpha_0 + \rho_1 I_t \hat{\varepsilon}_{t-1} + \rho_2 (1 - I_t)\hat{\varepsilon}_{t-1} + A_{11}(L)\Delta SP_{t-i} + A_{12}(L)\Delta MR_{t-i} + u_{1t} \quad (5)$$

$$\Delta MR_t = \tilde{\alpha}_0 + \tilde{\rho}_1 I_t \hat{\varepsilon}_{t-1} + \tilde{\rho}_2 (1 - I_t)\hat{\varepsilon}_{t-1} + A_{21}(L)\Delta SP_{t-i} + A_{22}(L)\Delta MR_{t-i} + u_{2t} \quad (6)$$

where $u_{1,2t} \sim i.i.d.(0, \sigma^2)$ and the Heaviside indicator function is set in accord with (4). This model specification recognizes the fact that the stock prices and hence the investors (because the investors collectively determine the stock prices) respond differently depending on whether the basis is widening or narrowing, i.e., contractionay or expansionary monetary policy.

The following are the estimation results for the M-TAR VEC model specified by equations (4), (5), and (6) using the monthly

Table 2: Malaysian Share Prices and Money Supply M1, Malaysian Data, 1985:2 to 2010:07

$$\Delta SP_t = 0.0112 - 0.5815 I_t \hat{\varepsilon}_{t-1} - 0.6628(1 - I_t)\hat{\varepsilon}_{t-1} + A_{11}(L)\Delta SP_{t-i} + A_{12}(L)\Delta MS_{t-i} + u_{1t}$$

(0.2648) (-8.9073*) (-6.9806*) F_{11}=7.9976[0.005] F_{21}=6.9231[0.001]

$Q_{(8)}$ = 3.8210[0.8729] *ln L* = -305.4477 $F_{(5,284)}$-*statistic* =34.1722*

$$\Delta MS_t = 0.0049 + 0.0153 I_t \hat{\varepsilon}_{t-1} - 0.0091(1 - I_t)\hat{\varepsilon}_{t-1} + A_{21}(L)\Delta SP_{t-i} + A_{22}(L)\Delta MS_{t-i} + u_{2t}$$

(0.2374) (0.4490) (-0.1848) F_{21}=6.9087[0.000] F_{22}=45.9180[0.000]

$Q_{(8)}$ =13.5940[0.0930] *ln L* = -85.7503 $F_{(16,266)}$-*statistic* =27.2367*

percentage changes in the Malaysian equity price index and in the monthly money supply M1. In the report of the estimation results, $A_{ij}(L)$ represents the first-order polynomials in the lag operator L. The F_{ij} represents the calculated *F-statistics* with the p-value in square brackets testing the null hypothesis that all coefficients of A_{ij} are equal to zero. The *t-statistics* are reported in parentheses with *"*"* indicating the 1 percent significant level. $Q_{(8)}$ is the Ljung-Box statistics and its significance is in square brackets, testing for the first eight of the residual autocorrelations to be jointly equal to zero. *ln L* is the log likelihood. The overall *F-statistics* with *"*"* indicates the significance level of 1 percent.

An analysis of the overall empirical results indicates that the estimated equations (5) and (6) are absent of serial correlation and have good predicting power as evidenced by the Ljung-Box statistics and the overall *F-statistics,* respectively. As to the long-run adjustment, the estimation results of the M-TAR VEC reveal that both ρ_2 and ρ_1 are statistically significant at 1 percent level, indicating that the share price index adjusts to positive and negative discrepancies in the difference between the stock price index and the money supply M1. In fact, $|\rho_1| < |\rho_2|$ in equation (5) indicates that the returns on the share price index adjust faster when the spread is narrowing than when the spread is widening, when the short-run dynamic responses are allowed. With regard to the long-term adjustment of the monthly money supply M1, the estimation results of equation (6) show $|\tilde{\rho}_1| > |\tilde{\rho}_2|$. However, not only does $|\tilde{\rho}_1|$ have the wrong sign, but also both $|\tilde{\rho}_1|$ and $|\tilde{\rho}_2|$ are not statistically significant at any conventional level, indicating that the monthly money supply M1 does not respond to either the widening or the narrowing of the difference between the share price index and the money supply in the long run.

In addition to estimating the long-run equilibrium relationship and asymmetric adjustment, the estimated M-TAR VEC model also allows for the determination of short-run dynamic adjustments as measured by the Granger causality between the changes in Malaysian return on equity portfolio and in the money supply M1. The partial *F-statistic* in equation (5) reveals that the returns on share price index respond to both the lagged changes in the money supply and its own lagged changes. Additionally, the empirical results indicate that the money supply responds to both lagged changes in 0Malaysian return on equity portfolio and its own lagged changes. These findings suggest a bi-directional Granger causality from the money supply to share price index, i.e., the share price index and the money supply M1 affect each others' movements. The bidirectional Granger causality suggests that the monthly percentage changes in the Malaysian equity price index and in the monthly money supply M1 affect each other's movement, thus, reflecting both the neoclassical and the post-Keynesian positions on the equity market. These findings suggest that Malaysian stock prices respond to countercyclical monetary policy actions and that narrowly defined money supply is responsive to equity market conditions. Moreover, stock prices are changed by investors, and money supply changes reflect monetary policy actions, including monetary authority's decision not to react to market developments. The empirical results can then be alternatively interpreted to indicate that equity investors in the Malaysian stock market are responsive to monetary policy actions and that monetary authority utilizes its countercyclical monetary policy to influence the equity market, i.e., Malaysian countercyclical monetary policy does matter in the short run.

POLICY IMPLICATION AND CONCLUDING REMARKS

Changes in the growth rate of the money supply M1 is an indicator of changes in future macroeconomic conditions such as inflation, interest rate, and unemployment; sophisticated and unsophisticated investors alike will react according to their ability to access research information and reposition their portfolios. Consequently, equity prices will move, and hence the market equity price index. The results of this study empirically confirm the cointegration relationship between the Malaysian equity price index and the narrowest defined money supply M1. In fact, these results can be interpreted to indicate that Malaysian equity market investors respond to countercyclical monetary policy differently in different phases of the business cycles.

The empirical findings further reveal that the basis—the spread between monthly changes in the Malaysian equity price index and in the monthly money supply M1—adjusts faster to the long-run threshold value when the Malaysian monetary authority tightens the monthly money supply, widening the above basis, than when the authority eases the monetary policy, narrowing the basis. These findings suggest that the spread is more responsive to signals of possible contractionary monetary policy as reflected in the decrease in the monthly money supply M1. These results suggest that the monetary policy financially affects Malaysian corporations differently in different phases of the business cycles. These findings also imply that the Malaysian capital market forces eliminate excessive returns on equity investment faster than they correct the earning deficiencies. Also, these empirical findings contradict reports by Nguyen et al. (2010) with respect to the US weekly S&P 500 stock price index and weekly announced money supply M1 and are most likely the results of the influences of Islamic finance in the Malaysian equity market.

With regard to the Granger causality between stock prices and the money supply, the partial *F-statistics* in equations (4) and (5) reveal a bi-directional Granger causality from the money supply to the share price index, i.e., the monthly percentage changes in the Malaysian share price index and in the monthly money supply M1 affect each others' movements, thus, reflecting both the neoclassical and the post-Keynesian positions on the equity market. This bidirectional Granger causality indicates that Malaysian countercyclical monetary policy does matter.

As to the policy implication, due the well-known long impact lag of the countercyclical monetary policy, countercyclical monetary policy actions are historically taken in a series of small increments to achieve their objective. The empirical findings of bi-directional Granger causality and changes in the spread display differing amounts of autoregressive decay depending on whether the change in the previous period is increasing or decreasing and suggest that not only the magnitude of Malaysian

countercyclical monetary policy actions but also the size of the increments of the policy actions do matter in the equity market. The empirical findings are very important for monetary authority to consider when implementing its monetary policy design to achieve its objective.

REFERENCES

Arak, M., S. Englander, and E. Tang, 1983, Credit Cycles and the Pricing of the Prime Rate", *Federal Reserve Bank of New York Quarterly Review*, pp.12-18.

Bursa Malaysia Berhad, Exchange history, [online; cited May 20, 2010. Available from URL: http://www.bursamalaysia.com.]

Chan, K.S., 1993, Consistency and Limiting Distribution of the Least Squares Estimator of a Threshold Autoregressive Model. *Annals of Statistics*, 21(2), pp. 520-533.

Cook, T. and T. Hahn, 1989, The Effect of Changes in the Federal Funds Rate Target on Market Interest Rates in the 1970s, *Journal of Monetary Economics*, 24, pp. 331-351.

Country profile 2006, Malaysia, Library of Congress-Federal Research Division, September.

Dueker, M.J., 2000, Are Prime Rate Changes Asymmetric? *Federal Reserve Bank of St. Louis Economic Review*, September/October, pp. 33-40.

Diebold, F.X. and S. A. Sharpe, 1990, Post-Deregulation Bank Deposit Rate Pricing: The Multivariate Dynamics. *Journal of Business & Economic Statistics*, 8(3), pp. 281-291.

Enders, W., 2010, *Applied Econometric Time Series*, 3rd Edition, (John Wiley & Sons, US).

Enders, W. and C.W.J. Granger, 1998, Unit Root Tests and Asymmetric Adjustment with an Example Using the Term Structure of Interest Rates, *Journal of Business and Economic Statistics*, 16(3), pp. 304-311.

Enders, W. and P.L., Siklos, 2001, Cointegration and Threshold Adjustment, *Journal of Business and Economic Statistics*, 19(2), pp. 166-176.

Engel, R. F., C.W.J., Granger, 1987, Cointegration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55, pp. 251-276.

Ewing, B. T., S. M., Hammoudeh, and M. A., Thompson, 2006, Examining Asymmetric Behavior in US Petroleum Futures and Spot Prices, *Energy Journal*, 27(3), pp. 9-23.

Forbes, S.M. and L. S. Mayne, 1989, A Friction Model of the Prime, *Journal of Banking and Finance*, 13, pp. 127-135.

Frost, D. and R. Bowden, 1999, An Asymmetry Generator for Error-Correction Mechanisms with Application to Bank Mortgage-Rate Dynamics, *Journal of Business & Economic Statistics*, 17(2), pp. 253-263.

Froyen, R., 2009, Macroeconomics: Theories and Policies, 9th Edition, (Pearson, Prentice-Hall, US).

Goldberger, M.A., 1984, The Sensitivity of the Prime Rate to Money Market Conditions, *Journal of Financial Research*, 7(4), pp. 269-280.

Hannan, T.H. and A. N. Berger, 1991, The Rigidity of Prices: Evidence from the Banking Industry, *American Economic Review*, 81(4), pp. 938-945.

Heffernan, S.A., 1997, Modeling British Interest Rate Adjustment: An Error Correction Approach, *Economica*, 64, pp. 211-231.

Hofmann, B. and P. Mizen, 2004, Interest Rate Pass-Through and Monetary Transmission: Evidence from Individual Financial Institutions' Retail Rates, *Economica*, 71, pp. 99-123.

IMF Country Report No. 09/253, 2009, Washington: International Monetary Fund,

Levine, P. and P. D. Loeb, 1989, Asymmetric Behavior of the Prime Rate of Interest, *American Economist*, 33, pp. 34-38.

Malaysia: Country Study, 2007. Guide International Business Publication, USA, Washington DC, USA-Malaysia

Mester, L.J. and A. Saunders, 1995, When Does the Prime Rate Change? *Journal of Banking and Finance*, 19, pp. 743-764.

Moazzami, B., 1999, Lending Rate Stickiness and Monetary Transmission Mechanism: The Case of Canada and the United States, *Applied Financial Economics*, 9, pp. 533-538.

Neumark, D. and S. Sharpe, 1992, Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits, *Quarterly Journal of Economics*, 107(2), pp. 657-680.

Nguyen, C. V., O. Paskelian, and J. Whitworth, 2010, Stock Price Behavior and the M1 Money Supply, *the Global Journal of Finance and Economics*, 7(1), pp. 11-19

Sarno, L. and D. L. Thornton, 2003, The Dynamic Relationship Between the Federal Funds Rate and the Treasury Bill Rate: An Empirical Investigation," *Journal of Banking and Finance*, 27, pp. 1079-1110.

Scholnick, B., 1999, Interest Rate Asymmetries in Long-Term Loan and Deposit Markets, *Journal of Financial Services Research*, 16, pp. 5-26.

Thompson, M.A., 2006, Asymmetric Adjustment in the Prime Lending-Deposit Rate Spread, *Review of Financial Economics*, 15(4), pp. 323-329.

Tkacz, G., 2001, Endogenous Thresholds and Tests of Asymmetry in U.S. Prime Rate Movements, *Economics Letters*, 73, pp. 207-211

LEARNING FROM FOLLOWERS: LEADERSHIP BEHAVIORS LINKED TO MEMBERS' EXTRA EFFORT IN SMALL, FAST-FORMING, SHORT-DURATION TEAMS

David Notgrass, Tarleton State University
Charlene Conner, Parker University

INTRODUCTION

As organizations increasingly participate in a globalized environment that provides all competitors availability to the same markets, resources, and strategies, even more importance is placed on the members' levels of *extra effort* as a means to developing a competitive advantage. Modern approaches to managing organizational human resources include the use of small, fast-forming, short-duration teams including task forces, committees, and project teams. Leading these special purpose teams through their engagement cycles require an approach that yields positive results from each team member. This study, in an effort to improve leadership practices, gathered data from the followers' perspective and identified specific leadership behaviors that have predictive values in the members' levels of extra effort in small, fast-forming, short-duration teams.

DEVELOPMENT OF LEADERSHIP AND FOLLOWERSHIP THEORY

The mutually dependent nature of the relationship between leaders and followers is clearly demonstrated in the Hogg (2001) assertion that "leaders exist because of followers and followers exist because of leaders" (p. 185). Most current definitions of leadership also include both leaders and followers with the concept that leadership is a process whereby leaders influence followers' thoughts and/or behavior (Northouse, 2013; Yukl, 2013). Kellerman (2008) provided a current definition of followership as "the response of those in subordinate positions (followers) to those in superior ones (leaders). Followership implies a relationship between subordinates and superiors, and a response of the former to the latter" (p. xxi).

Although both leaders and followers are essential to the leadership process, there has been a division in research oriented toward understanding leaders and followers (Baker 2007; Burns 1978; Yukl, 2013). While the definition of leadership includes the existence of followers, studies of leadership have historically paid little interest to the characteristics of followers (Dvir and Shamir 2003; Marion and Uhl-Bien 2001; Yukl, 2013). Yukl addressed the lack of research aimed toward followership in his analysis "only a small amount of research and theory emphasizes characteristics of the follower" (p. 16). In light of the noted deficiency in the study of followers, this study used data from the perspective of the follower to improve leadership practice.

Leadership behaviors can be measured using questionnaires that measure specific behaviors grouped into scales reflecting transactional, transformational, and leadership avoidant concepts. Both transactional and transformational leadership can be considered as using exchanges (transactions) between the leader and follower (Graen & Uhl-Bien, 1995). Exchange process, as applied in leadership studies, describes relationships existing as exchanges of desirable outcomes between leaders and individual followers (Blau, 1960; Cook & Whitmeyer, 1992; Homans, 1958). *Material exchanges* are exemplified as exchanging one thing for another, such as the material compensation exchanged for fulfillment of the requirements. *Social exchanges* are more directed toward the development and growth of the follower, may be more inspirational in nature, and are exemplified by aligning the goals of the follower, leader, and the organization (Bass & Avolio, 2004; Graen & Uhl-Bien, 1995).

Transactional leadership demonstrates a form of material exchange relationship focusing on meeting each member's own self-interest (Bass, 1985). Leaders using a transactional style "work toward recognizing the roles and tasks required for associates to reach desired outcomes" (Bass & Aviolio, 2004, p. 21) and help to clarify expectations for follower's effort and achievement in a *quid-pro-quo* approach in which the leader defines both the expected behavior and contingent reward (Bass, 1975). The three dimensions within transactional leadership methods are *contingent reward, management-by-exception: active* and *management-by-exception: passive.* The contingent reward dimension is the set of behaviors used by leaders to establish material exchanges with followers, and the two management-by-exception dimensions are the sets of behaviors used by leaders take corrective action in response to the results of the followers' efforts. Management-by-exception: active leaders monitor followers' behavior, anticipate problems, and take corrective actions before problems become serious, and management-by-exception: passive leaders monitor results and take corrective actions after problems have occurred (Bass, 1999; Bass & Avolio 2004; Judge & Piccolo, 2004). Management by exception-passive leadership behaviors are often included in the subset of leadership-avoidant leadership.

Transformational leadership, as identified by Burns (1978) and later by Bass (1985, 1995, 1999, 2004), interacts with followers in ways that contingent reward and management-by-exception does not. Transformational leaders raise the level of awareness of the followers and trigger conscious choices of behaviors between conflicting needs, values, and goals (Burns). Transformational leaders have an effect on followers that "raises their awareness about issues of consequences, shifting them through higher-level needs, influencing them to transcend their

own self-interests for the good of the group or organization" (Bass, 1985, p. 29).

Bass and Avolio (1999, 2004) identified several leadership behaviors contributing to transformational leadership. *Charisma* or *idealized influence* describes the degree that leaders' behaviors (convictions, positions, emotional appeals) create a common identity within the follower with the leader. *Inspirational motivation* describes the degree that the leader is able to describe a vision that is appealing and provides meaning to the follower. *Intellectual stimulation* describes the degree that the leader is able to stimulate thought and creativity within the follower. *Individualized consideration* describes the degree that the leader addresses the needs of the follower (Bass & Aviolio, 2004).

Leaders using a transactional style, based on material exchange relationships, help to clarify expectations for follower's effort, achievement and associated rewards (Bass, 1998). Team leaders that define/update the work agenda, task assignments, performance metrics, timelines, and awards are exhibiting transactional leadership behaviors. Transformational leadership, representing more of a form of social exchange relationships, challenges followers to assess higher level values and behaviors (Burns, 1978). Team leaders that speak to the significance of the role of the team's charge in relation to the overall mission and goals of the organization, the link between the team's goals and the values of the leader, and spend time ensuring the professional development of the team members are exhibiting transformational leadership behaviors. Bass (1998) suggests it is transactional leadership, through honoring commitments of contingent rewards, creates trust, dependability, and perceptions of consistency, which in turn form the basis of transformational leadership.

Effort

The concept of *effort* can be described as the use of physical or mental energy to do something. Individuals' efforts have been linked to various leadership concepts. For example, contingent reward leadership has been generally described as 'exchanging rewards for expected effort' (Bass, 2004), while intellectual stimulation leadership behaviors have been linked with increases in "followers' effort to be innovative and creative" (pg. 97). Bass and Avolio (2004) have come to define and measure *extra effort* across the three dimensions of the leaders' ability to influence the followers 1) to do more than the followers originally expected, 2) to try harder, and 3) to increase their desire to succeed.

Vroom (1964) provides insight into the tasks facing leaders as they influence the level of their followers' work effort in his wording "attempts to predict or explain the amount of task-related effort must consider both the *valence* of possible outcomes to that person and his *expectancies* regarding the consequences of different levels of effort for attaining them" (p. 192). These concepts form the basis of Vroom's (1964) expectancy theory of motivation, and needs to be recognized as underlying factors impacting leadership behaviors influencing the thoughts and behaviors of their followers.

Practitioner oriented studies such as this one may be more focused on '*what* specific leadership behaviors influences extra effort' rather than '*why* specific leadership behavior influences extra effort'. This practitioner study, while recognizing Vrooms' argument, lays the foundational work for future studies more focused on understanding the role of valence of outcomes in regard to previously identified effective leadership behaviors.

Based on the discussions concerning the elements of leadership and levels of followers' extra effort, this study proposed the following research question:

In small, fast-forming, short-duration team environments, is there a relationship between followers' perceived leadership behaviors from their group leader and the followers' levels of extra effort?

In attempt to answer the research question, this study proposed the following hypotheses:

H_{1a} *There is a relationship between followers' perceived transactional leadership behaviors from their group leader and the followers' levels of trying harder.*

H_{1b} *There is a relationship between followers' perceived transformational leadership behaviors from their group leader and the followers' levels of trying harder.*

H_{1c} *There is a relationship between followers' perceived leadership-avoidant behaviors from their group leader and the followers' levels of trying harder.*

H_{2a} *There is a relationship between followers' perceived transactional leadership behaviors from their group leader and the followers' levels of doing more than originally expected.*

H_{2b} *There is a relationship between followers' perceived transformational leadership behaviors from their group leader and the followers' levels of doing more than originally expected.*

H_{2c} *There is a relationship between followers' perceived leadership-avoidant behaviors from their group leader and the followers' levels of doing more than originally expected.*

H_{3a} *There is a relationship between followers' perceived transactional leadership behaviors from their group leader and the followers' levels of desire to succeed.*

H_{3b} *There is a relationship between followers' perceived transformational leadership behaviors from their group leader and the followers' levels of desire to succeed.*

H_{3c} *There is a relationship between followers' perceived leadership-avoidant behaviors from their group leader and the followers' levels of desire to succeed.*

METHOD

Overview and Design

This research, conducted in small, fast forming, short-duration team contexts, examined specific leadership behaviors at the practitioner level and their predictive values toward follower's extra effort. The study use the research model as depicted in Figure 1:

Procedure

The study gathered data from 172 participants, all members of small, fast-forming, short-duration groups. The teams all had assigned leaders, were generally no more than five members and, in most cases, were no more than three weeks in life span. Given the short duration, all of the teams were fast-forming in that they were expected to begin to execute shortly after assembly. Examples of team uses include accreditation evaluation teams, task forces, and cross-functional problem solving teams. The sample members were from university and national government agency teams within the U.S. A demographic assessment of the sample revealed that the respondents were almost equally distributed between male and female (52.3% male, *n=90*; 47.7% female, *n=82*), and distributed between the ages of 25 to 39 years (19.8%, *n=34*), ages 40 to 49 years (21.5%, n=37), ages 50 to 59 years (37.2%, *n=64*) and 60 years and over (21.5%, *n=37*). The respondents all held college degrees, distributed between bachelor's degree level (32.0%, *n=55*), master's degree level (27.9%, *n=48*), and doctorate degree level (40.1%, *n=69*).

Measures

The study used the *MLQ (Form-5x short)* questionnaire developed to measure team members' perceptions of levels of leadership behaviors across transformational, transactional, and avoidant leadership styles. Sample transformational leadership behaviors from the questionnaire include "emphasizes the importance of having a collective sense of mission", "seeks differing perspectives when solving problems", and "treats me as an individual rather than just as a member of a group". Sample transactional leadership behaviors from the questionnaire include "discusses in specific terms who is responsible for achieving performance targets", "keeps track of all (team members') mistakes", and "provides me with assistance in exchange for my efforts". Sample leadership-avoidant behaviors from the questionnaire include "fails to interfere until problems become serious" and "waits for things to go wrong before taking action" (Bass & Avolio, 2004).

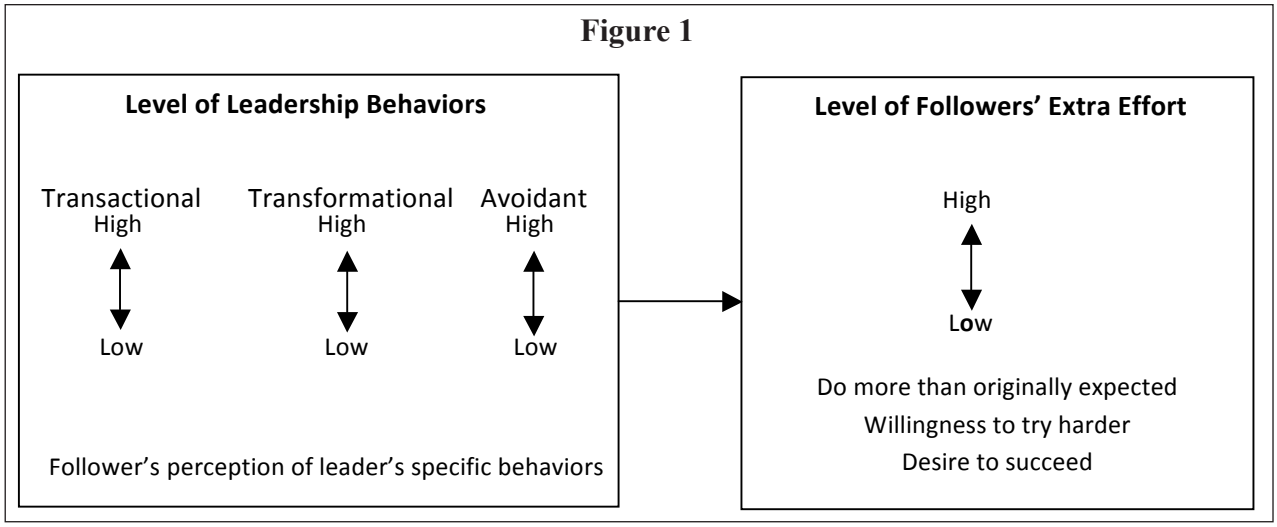
The study used the three additional questions from the *MLQ (Form-5x short)* to measure the followers' levels of extra effort. The questions used were "gets me to do more than I expected to do", "heightens my desire to succeed", and "increases my willingness to try harder" (Bass & Avolio 2004).

The study used the Pearson r correlation coefficient to determine the strength and direction of correlation between the variables. The correlation coefficient could range from -1.0 to +1.0 and a level of correlation (r) of +-.175 was required for the level of correlation to be determined as significant. After the variables with the highest levels of correlation were determined, linear regression calculations were performed to determine the levels of predictive values of the dependent variables.

RESULTS / FINDINGS

The permissions for using the *MLQ (5-x short)* do not allow for presenting for publication all of the questions that make up the questionnaire. Since this is a study that is concerned with improving leadership practice through determining specific leadership behaviors that predict followers' levels of extra effort (as defined by the attributes of willingness to try harder, doing more than originally expected, and heightens desire to succeed), the study aggregated for presentation the five leadership behaviors most highly correlated across all three attributes (Table 1). This allowed the researchers to 1) stay within the permissions guidelines, 2) present hypothesis testing results, and 3) identify behaviors that lead to better leadership practice.

Figure 1



Correlations

Table 1 shows the leadership behaviors with the highest level of correlation with followers' 'willingness to try harder'. The results demonstrate significant levels of correlation (*r*) ranging from -.267 to +.688 across behaviors from transactional, transformational, and leadership-avoidant scales and provide support for Hypotheses H_{1a}, H_{1b}, and H_{1c}.

Table 1 shows the leadership behaviors with the highest level of correlation with followers' 'doing more than originally expected to do'. The results demonstrate significant levels of correlation (*r*) ranging from -.179 to +.526 across behaviors from transactional, transformational, and leadership-avoidant scales and provide support for Hypotheses H_{2a}, H_{2b}, and H_{2c}.

Table 1 shows the leadership behaviors with the highest level of correlation with followers' 'heightens desire to succeed'. The results demonstrate significant levels of correlation (*r*) ranging from -.254 to +.743 across behaviors from transactional, transformational, and leadership-avoidant scales and provide support for Hypotheses H_{3a}, H_{3b}, and H_{3c}.

Findings relative to improving leadership practice

The study determined specific transactional, transformational, and leadership-avoidant behaviors having significant levels of correlation with the followers' *extra effort* attributes of *willingness to try harder, heightened desire to succeed,* and *doing more than originally expected.* This study was designed to use the data in a prescriptive manner that could be used to

Table 1

Means, Standard Deviations, and Correlations of Variables (Leadership Behaviors and Followers' Attributes of Extra Effort)

Variable	*M*	*SD*	1	2	3	4	5	6	7	8
Positively Correlated										
1. Increases willingness to try harder	3.08	.98	-							
2. Follower does more than originally expected	2.48	1.18	.56*	-						
3. Heightens followers' desire to succeed	3.20	1.00	.76*	.58*	-					
4. Expresses confidence goals will be achieved[2]	3.36	.81	.68*	.50*	.59*	-				
5. Is effective in meeting my job-related needs[2]	3.22	.87	.67*	.47*	.67*	.69*	-			
6. Helps me to develop my strengths[2]	2.80	1.13	.66*	.52*	.74*	.62*	.65*	-.45*	.61*	
7. Acts in ways that builds my respect[2]	3.26	.93	.65*	.68*	.57*	.64*	-.50*	.54*	.46*	
8. Makes clear what one can expect to receive when performance goals are achieved[1]	2.66	1.05	.58*	.44*	.55*	.44*	-			
Negatively Correlated										
1. Increases willingness to try harder	3.08	.98	-							
2. Follower does more than originally expected	2.48	1.18	.56*	-						
3. Heightens followers' desire to succeed	3.20	1.00	.76*	.58*	-					
4. Waits for things to go wrong before acting[3]	1.19	.53	-.34*	-.19*	-.27*	-				
5. Avoids making decisions[3]	1.26	.71	-.30*	-.20*	-.30*	.16*	-			
6. Demonstrates that problems must become chronic before acting[3]	1.20	.53	-.26*	-.18*	-.25*	.54*	.24*	-		

* Correlation is significant at the .01 level (2-tailed)
[1]Transactional [2]Transformational [3]Management-by-Exception: *Passive*

Table 2

Relationship between Leadership Behavior and Increases Willingness to Try Harder

Leadership Behavior (Independent Variable)				Follower Response (Dependent Variable)				
				Y = a + b (X)				
Leadership Behavior (IV)				*Resulting DV Score*				
(Rated as 1-'Not at all' to 5-'Frequently')				*From IV Rating (1 through 5)*				
Positively Correlated	*r*	*a*	*b*	*1*	*2*	*3*	*4*	*5*
– Expresses confidence goals will be achieved[2]	.688*	.274	.835	1.11	1.94	2.78	3.61	4.45
– Is effective in meeting my job-related needs[2]	.675*	.598	.768	1.37	2.13	2.90	3.67	4.44
– Helps me to develop my strengths[2]	.664*	1.46	.578	2.04	2.62	3.20	3.77	4.35
– Acts in ways that builds my respect[2]	.651*	.830	.688	1.52	2.21	2.89	3.58	4.27
– Makes clear what one can expect to receive when performance goals are achieved[1]	.579*	1.64	.541	2.18	2.72	3.26	3.80	4.34
Negatively Correlated								
– Waits for things to go wrong before taking action[3]	-.341*	3.29	-.387	2.91	2.52	2.13	1.74	1.36
– Avoids making decisions[3]	-.305*	3.23	-.294	2.94	2.64	2.35	2.05	1.76
– Demonstrates that problems must become chronic before taking action[3]	-.267*	3.25	-.303	2.95	2.65	2.34	2.04	1.74

* Correlation is significant at the .01 level (2-tailed)
[1]Transactional [2] Transformational [3]Management-by-Exception: *Passive*

improve leadership practice. The study led to determining five specific behaviors that would be highly effective across all three followership attributes. Using the same type of thought, the study sought to determine specific behaviors that had high negative correlation across all three followership attributes. The study determined three leadership behaviors that were negatively correlated across all three attributes at a level of significance. These results are included in Table 1.

The five leadership behaviors with the highest *positive* correlations with all three followership extra effort attributes were a combination of three transformational behaviors, one transactional behavior, and one behavior (or set of behaviors) identified as demonstrating a level of effectiveness in meeting the followers' job-related needs. One transformational leadership behavior with high correlation (r = .688, r = 598, r = 506) is from the *inspirational motivation subscale,* which describes the degree that the leader is able to describe with confidence the ability to achieve goals that are appealing to the follower. Another highly correlated (r = .664, r = .526, r = .742) behavior was 'helps me develop my strength', which is within the *individual consideration* subscale of transformational management. Another highly correlated (r = .651, r = .454, r = .615) transformational behavior is from the *idealized influence (attributed)* subscale and speaks to leadership behaviors that builds respect in the follower. The lowest, yet still significantly correlated (r = .579, r = .504, r = .547), behavior was within the *contingent reward* subscale of transactional leadership. This behavior speaks to the need to identify such structural tools as the system of rewards and clarifies what is to be received

Table 3

Relationship between Perceived Leadership Behavior (IV) and Doing More than Expected (DV)

Leadership Behavior (Independent Variable)				Follower Response (Dependent Variable)				
				Y = a + b (X) Resulting DV Variable Score From IV Rating (1 through 5)				
Leadership Behavior (IV)								
Positively Correlated	*r*	*a*	*b*	*1*	*2*	*3*	*4*	*5*
1 – Expresses confidence goals will be achieved[2]	.506*	.011	.736	0.75	1.48	2.22	2.96	3.69
2 – Is effective in meeting my job-related needs[2]	.477*	.382	.651	1.03	1.68	2.34	2.99	3.64
3 – Helps me to develop my strengths[2]	.526*	.948	.549	1.50	2.05	2.59	3.14	3.69
4 – Acts in ways that builds my respect[2]	.454*	.605	.575	1.18	1.76	2.33	2.91	3.48
5 – Makes clear what one can expect to receive when performance goals are achieved[1]	.504*	.979	.565	1.54	2.11	2.67	3.24	3.80
Negatively Correlated								
1 – Waits for things to go wrong before taking action[3]	-.195*	2.63	-.265	2.37	2.10	1.84	1.57	1.31
2 – Avoids making decisions[3]	-.206*	2.64	-.238	2.40	2.17	1.93	1.69	1.45
3 – Demonstrates that problems must become chronic before taking action[3]	-.179*	2.62	-.245	2.38	2.13	1.89	1.64	1.40

* Correlation is significant at the .01 level (2-tailed)
[1]Transactional [2] Transformational [3]Management-by-Exception: *Passive*

Table 4

Relationship between Perceived Leadership Behavior (IV) and Heighten Desire to Succeed (DV)

Leadership Behavior (Independent Variable)				Follower Response (Dependent Variable)				
				Y = a + b (X) Resulting DV Variable Score From IV Rating (1 through 5)				
Leadership Behavior (IV)								
Positively Correlated	*r*	*a*	*b*	*1*	*2*	*3*	*4*	*5*
1 – Expresses confidence goals will be achieved[2]	.598*	.727	.736	1.46	2.20	2.94	3.67	4.41
2 – Is effective in meeting my job-related needs[2]	.673*	.692	.777	1.47	2.25	3.02	3.80	4.58
3 – Helps me to develop my strengths[2]	.742*	1.37	.655	2.02	2.68	3.33	3.99	4.64
4 – Acts in ways that builds my respect[2]	.615*	1.05	.660	1.71	2.37	3.03	3.69	4.35
5 – Makes clear what one can expect to receive when performance goals are achieved[1]	.547*	1.82	.519	2.34	2.86	3.38	3.89	4.41
Negatively Correlated								
1 – Waits for things to go wrong before taking action[3]	-.278*	3.38	-.321	3.06	2.74	2.42	2.09	1.77
2 – Avoids making decisions[3]	-.306*	3.40	-.229	3.10	2.80	2.50	2.20	1.90
3 – Demonstrates that problems must become chronic before taking action[3]	-.254*	3.37	-.293	3.08	2.78	2.49	2.20	1.90

* Correlation is significant at the .01 level (2-tailed)
[1]Transactional [2] Transformational [3]Management-by-Exception: *Passive*

relative to goal achievement. While not a specific transactional or transformational behavior *per se*, being effective in meeting follower's job-related needs was included because of its high level of correlation (r = .675, r = .477, r = .673).

The study also demonstrated *negative* relationships between three specific leadership behaviors and levels of all three followers' extra effort attributes. The leadership behaviors with the highest *negative* correlation with extra effort were all either *management-by-exception-passive* or *passive avoidant* (laissez-faire) in nature. Management by exception – passive leaders monitor results and take corrective actions after problems have occurred. Passive avoidant leaders "react only after problems have become serious and may avoid making any decisions at all" (Bass & Avolio, 2004, p. 50). These correlations ranged from r = -341 to r = -179, and while not demonstrating as high a level of relationship between leadership behavior and follower outcomes as the positively correlation behaviors, the correlations are significant and should be included in this discussion.

Linear Regressions

Using linear regression, these leadership behaviors can be used to predict levels of follower outcomes of willingness to try harder, doing more than the follower initially expected to do, and heightened desire to succeed. In the questionnaire construction, the range of rater response choices scaled from 'not at all' to 'frequently, if not always'.

The linear regression results are demonstrated in Table 2, Table 3, and Table 4. The results identified levels of both leaders' behaviors (IV) and predicted followers' behaviors (DV). For example, the leaders' scoring at the 'frequently, if not always' (5) level predict the follower scoring at the 'fairly often' (4) level. This predictability is apparent across all behaviors and follower domains. In looking at the negatively correlated leadership behaviors, moderate to high levels of perceptions of these behaviors drive followers' willingness to try harder down significantly.

The linear regressions indicate that the identified leadership behaviors have the most impact on the followers' attributes of 'willingness to try harder' and 'desire to succeed' (Table 2, Table 3, Table 4). The predicted results for these two attributes are very similar and indicate that leaders that practice these behaviors at almost a constant level will receive results at a similar level. The regressions also predict that the leadership behaviors return high levels of results on the followers' attribute of 'doing more than originally expected', but not as high a return as the other two attributes.

CONCLUSIONS / IMPLICATIONS FOR PRACTICE

Lord and Emrich (2001) spoke to the importance of understanding followers in their words "if leadership resides, at least in part, in the minds of followers, then it is imperative to discover what followers are thinking" (p. 551). With that exhortation in mind, the study addressed the research question:

Is there a relationship between followers' perceived leadership behaviors from their group leader and the followers' levels of extra effort within small, fast-forming, short-duration team contexts?

This study's research unique design was constructed from the perspective of team members (followers) as opposed to the more common leader-centric approach. The study also is unique in that it utilized the distinctive team construct of small, fast-forming, short-duration teams, which are in common use within organizations in the form of evaluation teams, committees, task forces, project teams, etc. The study's findings indicate that there are specific leadership behaviors that are 1) significantly correlated to and 2) are predictive of followers' levels of willingness to try harder, do more than expected, and desire to succeed.

Implications for practice

The current study has several key implications for leading small, fast-forming, short-duration groups. The first implication is that the most effective leaders use a combination of transactional and transformational behaviors. Bass (1998) moved the discussion from leaders being *either* transactional or transformational to the idea that the best leaders are *both* transactional and transformational. This study's findings support that concept. The five leadership behaviors most positively correlated with followers' levels of extra effort were a combination of behaviors coming from various leadership transactional and transformational subscales including inspirational motivation, individualized consideration, idealized influence, and contingent reward. The study also found that the three leadership behaviors most negatively correlated with followers' levels of extra effort were all passive-avoidant in style.

Leaders can use contingent reward behaviors to establish material exchanges by making clear what one can expect to achieve when performance goals are achieved. These exchanges can be aided by the inclusion of specific goals and objectives written in a format that is specific, measurable, attainable, relevant, and time-bound (SMART). Associated metrics and methods of gathering and reporting results would also be important tools in that process. The material exchanges are aided by performance management and salary administration systems and are dependent on the leader making clear connections between performance and reward.

Leaders can augment these material exchanges with social exchanges by expressing confidence that goals will be achieved and acting in ways that builds the followers' respect. The leaders can help followers develop their strengths and be effective in meeting their job-related needs through coaching, mentoring, and communication in both informal and formal sessions. These social exchanges, strengthened through specific transformational behaviors, contribute to the increased in extra effort and play a role in developing higher level leader-member exchanges (Graen & Uhl-Bien, 1995).

A second implication for leaders concerns the consistency of behavior. The study's findings illustrated that the followers

needed to perceive the leaders' behaviors as 'frequently, if not always' in order to rate their own level of extra effort as 'fairly often' (Table 1, Table 2, & Table 3). This implies that leaders need to ensure that these identified behaviors are exhibited on a near constant basis for the most effectiveness.

A third implication is a carry forward from the definition of leadership itself. Leadership is commonly defined as a *process* used to influence the thoughts and behaviors of others (Northouse, 2012; Yukl, 2013), which lends thought that, as a process, it can be designed, learned, and applied. The implication from this study is that individuals that are in leadership roles can improve their effectiveness in an intentional way. The findings that leaders can use a specific set of behaviors to impact team members levels of extra effort in both positive and negative ways by increasing and decreasing use of specific behaviors provides a set of tools that leaders can intentionally use to improve their leadership practice.

Limitations and future research

This study has several limitations. One limitation is the fact that the sample population is from the U.S. and represents a Western perspective. In light of our increasingly global approach to team building and membership, future studies should include populations that represent perspectives other than from the U.S. Another limitation is the lack of representation of younger team members. The study's sample was comprised of only 19.8% of members less than 40 years old. Given that our workforce includes members from several different generational cohorts, future studies should include populations fully representing perspectives from all age groups.

In conclusion, this study determined, from the followers' perspective, specific leadership behaviors that are correlated with and predicts levels of followers' extra effort in small, fast forming, short-duration teams. It identified five specific leadership behaviors that predicted positive results and three specific behaviors that predicted negative results. The study's findings adds to the body of knowledge in both research and practitioner settings and helps to set the stage for further research in the area of small-group leadership.

REFERENCES

Baker, S. D. (2007). Followership: The theoretical foundation of a contemporary construct. *Journal of Leadership and Organizational Studies,* 4(1), 50-60.

Bass, B. M. (1985). Leadership: Good, better, best. *Organizational Dynamics,* 13(3), 26-40.

Bass, B. M. (1995). Theory of transformational leadership redux. *The Leadership Quarterly,* 6(4), 463-478.

Bass, B. M. (1998). *Transformational leadership: Industrial, military, and educational impact.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Bass, B. M. (1999). Two decades of research and development in transformational leadership. *European Journal of Work and Organizational Psychology,* 8(1), 9-32.

Bass, B., & Avolio, B. (2004). MLQ Manual. Retrieved December 26, 2008. Available from Mind Garden, Inc.: www.mindgarden.com

Bass, B. M., & Riggio, R.E. (2006). *Transformational leadership* (2nd ed.). New York: Psychology Press.

Blau, P. M. (1986). *Exchange and power in social life.* New Brunswick, NJ: John Wiley.

Bolman, Lee G. and Deal, Terrence E. (2003). *Reframing organizations: Artistry, choice, and leadership.* San Francisco, CA: John Wiley and Sons.

Burns, J. M. (1978). *Leadership.* New York: Harper & Row.

Cook, K. S., & Whitmeyer, J. M. (1992). Two approaches to social structure: Exchange theory and network analysis. *Annual Review of Sociology,* 18, 109-127.

Dvir, T., & Shamir, B. (2003). Follower developmental characteristics as predicting transformational leadership: a longitudinal field study. *The Leadership Quarterly,* 14, 327-344.

Graen, G. B., & Uhl-Bien, M. (1995). Relationship-based approach to leadership: Development of leader-member exchange (LMX) theory of leadership over 25 years: Applying a multi-level multi-domain perspective. *The Leadership Quarterly,* 6(2), 219-247.

Hogg, M. A. (2001). A social identity theory of leadership. *Personality and Social Psychology Review,* 5(3), 184-200.

Homans, G. C. (1958). Social behavior as exchange. *The American Journal of Sociology,* 63(6), 597-606.

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analysis of their relative validity. *Journal of Applied Psychology,* 89(5), 775-768.

Kellerman, B. (2008). *Followership: How followers are creating change and changing leaders.* Boston: Harvard Business Press.

Lord, R. G., & Emrich, C. G. (2001). Thinking outside the box by looking into the box: Extending the cognitive revolution in leadership research. *The Leadership Quarterly,* 11(4), 551-579.

Marion, R., & Uhl-Bien, M. (2001). Leadership in complex organizations. *The Leadership Quarterly,* 12, 389-418.

Northouse, P. G. (2007). *Leadership: Theory and practice* (4th ed.). Thousand Oaks, CA: Sage Publications.

Vroom, V. H. (1964). *Work and motivation.* New York: John Wiley & Sons, Inc.

Yukl, G. (2013). *Leadership in organizations* (6th ed.). Upper Saddle Rivers, NJ: Prentice Hall.

PROPERTY CRIME AND TOP INCOME SHARES: NEW EVIDENCE FROM A PANEL OF STATES

Mark W. Frank, Sam Houston State University

"The appropriation of herds and flocks, which introduced an inequality of fortune, was that which first gave rise to regular government. Till there be property there can be no government, the very end of which is to secure wealth, and to defend the rich from the poor." Adam Smith in *Lectures on Jurisprudence* (1978, p. 404).

I. INTRODUCTION

Following the seminal contributions of Gary Becker (1968) and Isaac Ehrlich (1973), a large literature has emerged to empirically evaluate the relationship between economic factors and crime rates using macro panels. While relative success has been achieved in linking higher unemployment to increases in property crime rates (recent examples include, Samavati 2006; Lee and Holoviak 2006; Witt et. al. 1998; and Allen 1996), the empirical evidence relating income inequality to property crime has been surprisingly inconclusive. Imrohoroglu, Merlo, and Rupert (2004) and Witt, Clarke, and Fielding (1998) find evidence that income inequality increases property crime rates, yet Kelly (2000), Doyle, Ahmed, and Horn (1999), and Allen (1996) conclude that no significant relationship exists.[1]

This inconclusiveness is particularly troubling given the rapid acceleration of income inequality since the early 1980s (see for example, Piketty and Saez 2003, Krueger 2003, Gottschalk 1997). This paper pursues clarification of the crime/inequality relationship through the use of a new state-level panel of top income shares. A key limiting factor of past research has been the unavailability of large, macro-panels of income inequality measures.[2] While aggregate U.S. top income shares are readily available (e.g., Piketty and Saez 2003), cross-national and cross-state inequality measures are available only at low-frequencies.[3] This data limitation has led prior studies which use large-*N*, large-*T* macro panels to simply omit income inequality from their analysis (e.g., Levitt 1996).

The primary innovation of this paper is to use individual tax filing data available from the Internal Revenue Service (IRS) to construct our top income share measures.[4] Although IRS income data has several important limitations, including the censoring of individuals below a threshold level of income, it has the unique feature of being available annually for each state over the forty-five year period 1960 to 2004. These unique dimensions enable us to explore the relationship between property crime and top income shares through a variety of panel data estimation techniques, many of which follow from recent developments in the econometric literature.

The relationship we uncover is surprising; a greater concentration of income into the upper-end of the income distribution appears to be related to *lower* property crime rates. This finding would appear consistent with the view that a high concentration of income may encourage greater protection against crime. As Adam Smith suggests in *Lectures on Jurisprudence* (1978), when income is concentrated into the hands of a few, the risk of theft also becomes more concentrated, leading the wealthy to seek out greater protection of their property. A key caveat from our analysis follows from the narrow nature of inequality captured by top income share measures, however. While the recent literature has tended to follow Ehrlich's (1973) emphasis on the potential for poverty and broadly defined inequality (e.g., Gini coefficients) to encourage crime through the creation of greater relative payoffs (see for example, Kelly 2000), the censoring of low-end income earners from IRS income data prevents us from directly addressing these mechanisms.

The structure of the paper is as follows. Section II offers a simple reduced-form economic model of criminal behavior. Section III presents the new panel of annual state-level top income shares and crime measures. Section IV explains the empirical methodology and describes the empirical findings. Finally, Section V offers a brief set of conclusions.

II. A SIMPLE ECONOMIC MODEL OF CRIMINAL BEHAVIOR

Given an individual's moral predisposition regarding criminal activity, the decision to commit crime i can be viewed as a function of the costs and benefits from the criminal activity (see Ehrlich 1996, 1973). We assume that the expected net return per criminal offense (π_i) will be positively related to the expected payoff (loot) per offense (b_i), and negatively related to the direct costs from planning and executing a crime (c_i), the opportunity costs from any forgone legitimate market activities (w_i), and the product of the probability of being apprehended and convicted (p_i) times the penalty if convicted (f_i):

$$\pi_i = b_i - c_i - w_i - p_i f_i \qquad (1)$$

In the empirical analysis, we will focus our discussion on crimes with obvious material payoffs (b_i): burglaries, larceny-thefts, and robberies.

Many factors commonly thought to impact the decision to commit a crime are likely to impact equation *(1)* via multiple avenues. Increasing police protection, for example, is likely to

Figure 1. Trends in Average State-Level Property Crime and the Top 10% Income Share, 1960 to 2004

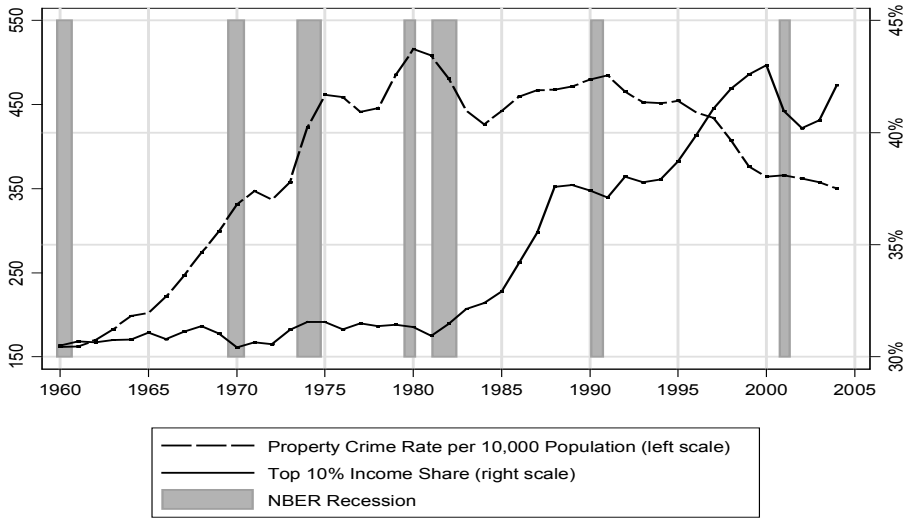


Figure 2. Trends in Average State-Level Property Crime Rates (per 10,000 Population) by Type of Crime, 1960 to 2004

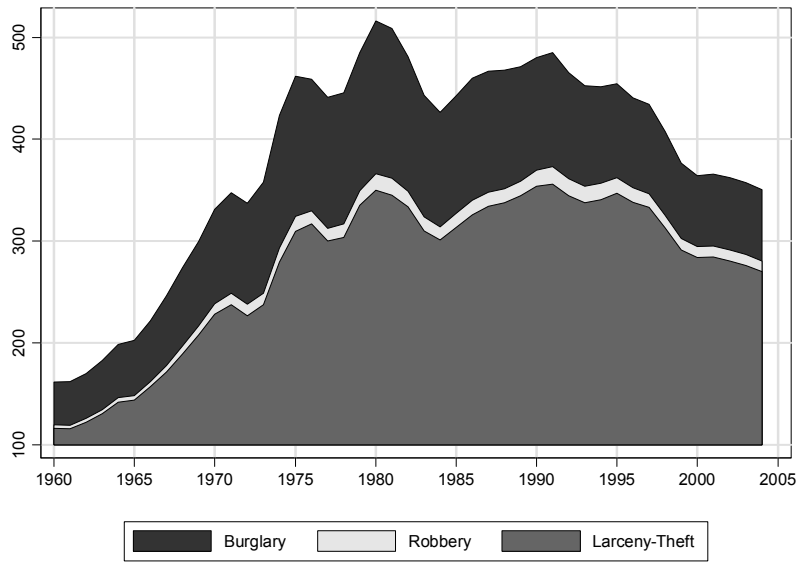
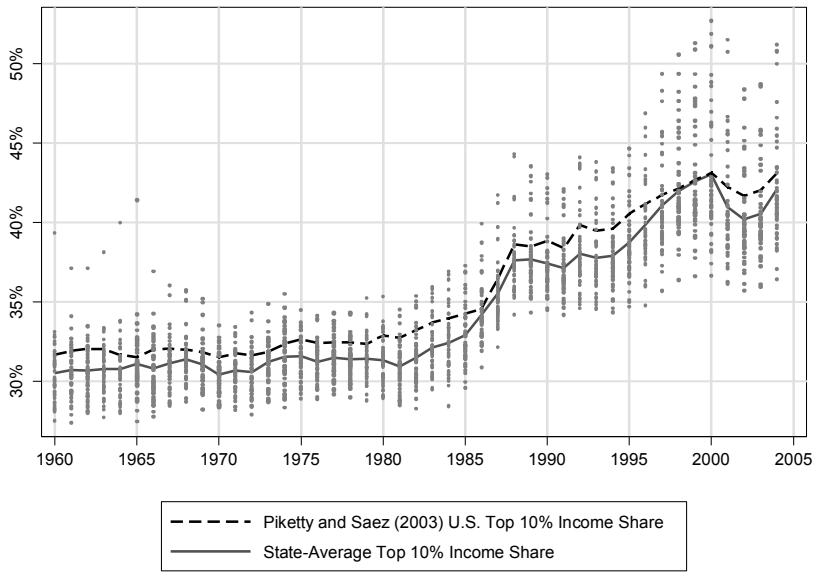


Figure 3. Comparison of New State-Level Panel with U.S. Time-Series Data of Piketty and Saez (2003), 1960 to 2004



increase the probability of being apprehended and convicted (p_i), and is also likely to increase the criminal's direct cost of planning and executing a crime (c_i). Past criminal activity may also impact an individual's decision to commit a crime. Being a convict may stigmatize an individual in the legitimate labor market, causing w_i to be lowered. Also, criminals likely learn by doing, meaning past criminal activity may lower c_i, and thus increase the incentive to commit a crime. Educational attainment may impact the decision to commit a crime in contrasting ways. First, higher levels of education are likely associated with greater legitimate market opportunities, causing w_i to be increased. However, greater education may also enable the individual to reduce the costs of planning and executing the crime (c_i), thereby increasing the incentive to commit a crime.

We also consider the impact of three macroeconomic variables: the unemployment rate, real income per capita, and income inequality. Following Ehrlich (1973), the unemployment rate is usually thought to be associated with alternative legitimate market activities. An increasing unemployment rate, as a result, would signify a decrease in w_i, and lead to an increase in the incentive to commit a crime (see also Lee and Holoviak 2006, Freeman 1996, Ehrlich 1996). Holding legitimate market opportunities constant, an increase in real income per capita would therefore indicate an increase in the expected payoff from criminal activity (b_i), leading to an increase in the incentive to commit a crime.

Finally, greater income inequality may represent an increase in the expected payoff from criminal activity if low-income individuals are placed in the proximity of high-income individuals with property worth taking (Ehrlich 1973, p. 539). Under this view, high inequality is associated with a large gap between the legitimate market opportunities of the low-income (w_i), and the expected payoff from criminal activity against the wealthy (b_i), leading to an increase in the incentive to commit a crime (see also, Thorbecke and Charumilind 2002, Kelly 2000, Chiu and Madden 1998).

Greater income inequality is also likely to impact the behavior of property owners. Under conditions of relative equity, the risks from property theft become spread more evenly throughout the population. When income is concentrated into the hands of a few, by contrast, the risks also become concentrated, leading high-income individuals to be more protective of their property. This protective response resulting from greater income concentration at the upper-end is not a new concept in economics. Adam Smith argues in *Lectures on Jurisprudence,* for example, unequal concentrations of income would necessitate the formation of public resources to "defend the rich from the poor" (1978, p. 404) (for discussions of Smith's views, see Gilbert 1997, Baum 1992).

The successful procurement of public resources for the protection of property could be related to two features inherent in conditions of increasing income concentration. First, a greater concentration of income at the upper-end may enhance the political influence of the high-income through the buying of votes of legislators, leading potentially to the subversion of legal and political institutions (Glaeser, Scheinkman, and Shleifer 2003). Second, the concentration of income into the hands of a few may lead to a small-number advantage helpful in overcoming the collective action problems of group organization (Olson 1971). Being less in number, high-income individuals may also find it easier to segregate themselves from the rest of the community (Bjorvatn and Cappelen 2003), making policing against criminal activity less costly and less cumbersome (Chiu and Madden 1998). Hence, under conditions of greater income concentration, high-income individuals seek out better protection of their property, causing the criminal's probability of being apprehended and convicted to (p_i) increase, and increasing the criminal's direct cost from planning and executing the crime (c_i).

III. THE DATA

The data are collected annually for forty-eight states over the forty-five year period 1960 to 2004. The state of New York is missing crime rates for the years 1960 to 1964, meaning the total number of observations is 2,155. Figure 1 presents the overall trends in income share of the top 10% and total property crime rates per 10,000 population for the period 1960 to 2004. Shaded areas show periods of recession as defined by the National Bureau of Economic Research (NBER). Property crime rates for the average state increased rapidly during the 1960s and 1970s, peaking in the year 1980 at a rate of 516 crimes per 10,000 population. The top decile's share of income for the average state, by contrast, remained stable throughout the 1960s and 1970s between 30.4% and 31.6%. Beginning in the early 1980s, however, the income share of the top decile increased rapidly, peaking at 43.0% in the year 2000. Despite this rapid increase in inequality, property crime rates fell substantially over the same period, reaching a 33-year low of 350 per 10,000 population in the year 2004.

Total property crime rate includes burglary, larceny-theft (including motor vehicle theft), and robbery.[5] Unlike burglary and larceny-theft, robbery is a violent form of property crime. Figure 2 presents the average state-level trends in each of the three property crime rates stacked annually over our sample period. Notice that robberies are a relatively small portion of total property crime (only 2.8% over the sample period), while burglaries and larceny-theft are comparatively large (25.2% and 72.0%, respectively).

Our primary measure of income inequality is the top decile share of income. This measure is derived from income data reported in *Statistics of Income* published by the IRS. The pre-tax adjusted gross income reported by the IRS is a broad measure of income. In addition to wages and salaries, it includes capital income (dividends, interest, rents, and royalties) and entrepreneurial income (self-employment, small businesses, and partnerships). Notable exclusions include interest on state and local bonds, and transfer income from federal and state governments. Further details on the construction of this measure are provided in Appendix A.

Aggregate U.S. trends in income inequality from IRS income data have been explored before, most notably by Piketty and Saez (2003), who construct several annual time-series measures

of U.S. top income shares beginning in the year 1913. Figure 3 presents a comparison of our new state-level inequality panel to the aggregate U.S. time-series data of Piketty and Saez. The solid line shows the trend in the (unweighted) state average for the top decile share of income from our new state-level panel. The dashed line is the aggregate U.S. top decile income share from Piketty and Saez (2003).[6] Individual points are the state-level observations from our new panel. Though one would not expect an exact match, our unweighted forty-eight state average is remarkably close to the aggregate U.S. inequality trend reported by Piketty and Saez. The Pearson's correlation coefficient between the two series is 0.995; the Theil U statistic is 0.033.[7]

One significant limitation of IRS income data, however, is the omission of some individuals earning less than a threshold level of gross income. This threshold varies by age and marital status, as well as the tax filing year. For this reason, we follow Piketty and Saez (2003) in using the top decile share of income as our primary measure of inequality. Other non-IRS data sources have the clear advantage of not omitting these low income individuals, but these sources are either not available annually, such as the decennial Census, or, in the case of the March *Current Population Survey* (CPS), are only available annually for more recent years. Akhand and Liu (2002), moreover, provide evidence that these survey-based alternatives suffer additional bias resulting from an "over-reporting of earnings by individuals in the lower tail of the income distribution and under-reporting by individuals in the upper tail of the income distribution" (p. 258). The IRS, unlike the March CPS or Bureau of the Census, will penalize respondents for income reporting errors.

Descriptive statistics for all the variables in raw form are presented in Table 1. Police protection is evaluated by constructing a measure of the average monthly police wage (real monthly police payroll expenditures for state and local police protection divided by the monthly state and local police FTE).[8] To gauge the penalty if convicted $\left(f_i\right)$, we use the number of prison inmates incarcerated at state and local prisons.[9]

Table 1. Descriptive Statistics of the Variables

Variable	Mean	Standard Deviation	Minimum Annual Mean (Year)	Maximum Annual Mean (Year)
Total Property Crime Rate [a]	381.319	149.700	161.63 (1960)	515.86 (1980)
Burglary Rate [a]	95.661	44.61	41.95 (1960)	149.71 (1980)
Larceny-Theft Rate [a]	274.001	105.80	115.56 (1961)	355.75 (1991)
Robbery Rate [a]	11.661	9.97	3.61 (1962)	17.13 (1991)
Average Monthly Police Wage (x 1,000) [b]	3.138	0.69	2.40 (1960)	3.83 (2003)
Prison Inmates (x 1,000)	11.266	19.61	3.57 (1973)	27.20 (2004)
High School Attainment	40.357	12.24	22.38 (1960)	56.43 (2004)
College Attainment	10.078	4.82	4.03 (1960)	17.54 (2004)
Unemployment Rate	5.621	1.98	3.61 (1969)	9.27 (1983)
Real Income per Capita [b]	23,064.720	6,278.95	13,459.92 (1960)	31,907.67 (2004)
Top 10% Income Share	34.571	4.75	30.41 (1970)	43.01 (2000)

[a] Per 10,000 population, [b] In constant 2004 dollars.

Table 2. Dynamic Fixed-Effects Estimates of Property Crime Rates Using Annual State-Level Panel, 1960 to 2004

	All Property Crime (1)	Burglary (2)	Larceny (3)	Robbery (4)
$crime\ rate_{i,t-1}$	0.903*** (0.01)	0.893*** (0.01)	0.897*** (0.01)	0.921*** (0.01)
$average\ police\ wage_{i,t}$	-7.700*** (2.45)	-1.910** (0.84)	-5.582*** (1.81)	-0.342* (0.18)
$prisoners_{i,t}$	-0.104** (0.04)	-0.053*** (0.01)	-0.039 (0.03)	-0.016*** (0.00)
$high\ school_{i,t}$	0.400 (0.30)	0.088 (0.10)	0.412* (0.22)	-0.025 (0.02)
$college_{i,t}$	-1.709*** (0.44)	-0.636*** (0.15)	-1.078*** (0.32)	-0.054* (0.03)
$unemployment_{i,t}$	1.390*** (0.43)	0.704*** (0.15)	0.784** (0.32)	-0.026 (0.03)
$real\ income\ per\ capita_{i,t}$	51.338*** (9.55)	17.611*** (3.28)	32.200*** (7.05)	2.520*** (0.70)
$top\ decile\ income\ share_{i,t}$	-1.009*** (0.36)	-0.346*** (0.12)	-0.625** (0.27)	-0.069*** (0.03)
R^2	0.965	0.957	0.961	0.974

*, **, ***: Significant at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses. All variables are mean-differenced to eliminate fixed-time effects.

Throughout the analysis we will also use two measures of human capital attainment: the proportion of the population with at least a high school degree, and the proportion with at least a college degree. Human capital attainment information is unavailable on an annual state-level basis for much of our early sample period, however. We constructed these measures of human capital attainment using the perpetual-inventory method proposed by Barro and Lee (1993). Appendix B further describes this construction and provides tests of its accuracy.[10]

IV. METHODOLOGY AND EMPIRICAL RESULTS

To evaluate the decision to commit a crime (see equation *1*) using aggregate state-level data, we begin by assuming the dynamic panel form:

$$crime_{i,t} = \lambda\, crime_{i,t-1} + \beta' X_{i,t} + \mu_i + \tau_t + \varepsilon_{i,t}, i = 1,2,...,N,\ t = 1,2,...,T, \quad (2)$$

where $crime_{i,t}$ is the crime rate in state i during period t, and $X_{i,t}$ is a vector of explanatory variables that include measures of the average monthly wage per police FTE, the state-level prison population, high school and college educational attainment, the unemployment rate, the log of real state income per capita, and the share of income of the top decile. μ_i is the time-invariant fixed effect for state i, τ_t is the state-invariant time effect for time t, and $\varepsilon_{i,t}$ is the idiosyncratic, time and state-varying error term.

Estimation of equation *(2)* has three obvious complications: the presence of fixed time-effects (τ_t), the presence of fixed state-effects (μ_i), and a lagged dependent variable on the right-hand-side. To eliminate fixed time-effects, the variables can be differenced from their cross-section means. For the inequality measures in particular, mean differencing is beneficial because of the long time span of the sample and the year-to-year incremental changes in tax laws associated with IRS income data. To eliminate individual state-effects, equation *(2)* may be estimated via the within-groups fixed effects (FE) estimator. Moreover, given the large time-series dimension of our panel ($T = 45$), the FE estimates of λ will be consistent and the bias small (see Judson and Owen 1999, Nickell 1981).

The dynamic FE estimates of equation *(2)* are presented in Table 2. The first column evaluates total property crime rates, the remaining three columns evaluate the three components of property crime: burglary, larceny-theft, and robbery. It is noteworthy that past crime rates are always positively and significantly related to current crime rates. Though largely ignored in prior empirical work (the exception is Fajnzylber et. al. 2002a, 2002b), significant inertia in crime rates is expected if convicts are either stigmatized in the legitimate labor market, leading to lower non-criminal wages (w_i), or if criminals learn by doing, thereby lowering the direct costs of planning and executing crimes (c_i).

As expected, higher average pay of police officers is related to lower property crime rates across all models. Higher average wages may reflect increases in apprehension and conviction probabilities (p_i), as well as increases in the criminal's direct cost of planning and executing a crime (c_i). Moreover, having a larger number of prison inmates also appears to consistently lower crime rates (the exception is larceny-theft, column 3) (see also, Levitt 1996). Prison populations may reflect increases in apprehension and conviction probabilities, as well as the penalty if convicted (f_i).

College attainment is negatively and significantly associated with each of the crime rates, while high school attainment does not appear to have a statistically significant relationship with most types of property crime. It is plausible that while greater education may increase an individual's legitimate market opportunities (w_i), it may also enable that individual to lower their costs of planning and executing a crime (c_i). The findings in Table 2 appear to support the hypothesis that college attainment increases legitimate market opportunities more than it lowers the costs of planning and executing a crime. With high school attainment, however, the increase in legitimate opportunities may approximately equal the decrease in the costs of planning and executing a crime. Larceny-theft is the exception; here the benefit from high school attainment appears to be less than the decrease in costs, leading to a positive and statistically significant relationship between high school attainment and larceny crime rates.

Unemployment is positively and significantly related to total property crimes, burglary, and larceny-theft, implying that poor opportunities in the legitimate labor market encourages criminal activity. This finding is generally consistent with the findings of Lee and Holoviak (2006), Samavati (2006), and Allen (1996), but contrasts with the insignificant association found by Imrohoroglu et. al. (2004). Holding unemployment conditions constant, real income per capita is positively and significantly associated with each of the four property crime rates. A positive relationship is plausible if average income is capturing the potential payoff (b_i) from criminal activity.

Finally, the top income decile is negatively and significantly associated with each of the four property crime rates. One interpretation of this finding is that greater income concentration leads high-income individuals to seek out better protection of their property, causing the criminal's probability of being apprehended and convicted (p_i) to increase, and increasing the criminal's direct cost from planning and executing a crime (c_i). The nature of this relationship is small, but nontrivial; from the estimates in column 1, the implied (short-run) crime-inequality elasticity is -0.09.

Table 3 re-estimates the total property crime model (Table 2, column 1) using three alternative top income share measures: the income share of the top 5%, top 1%, and top 90 to 99%. An interesting condition emerges; the relationship between property crime and top income shares appears driven narrowly by income concentration within the very upper-end of the income distribution. While each of the top income share measures (top 10%, top 5%, and top 1%) appears negatively related to property crime rates, when the upper-end of the income distribution is excluded, as with the top 90 to 99% income share in column 3, the relationship becomes statistically insignificant.

Nonstationary Heterogeneous Panel Estimation

One potential concern with the above analysis reflects the possibility of spurious regressions resulting from nonstationary data in the large-*T* panel setting, potential endogeneity among the regressors, and the strict assumption of slope homogeneity implicit with fixed-effects estimators (see chapter 12 in Baltagi 2005, Pesaran, Shin, and Smith 1999, and Pesaran and Smith 1995). Following Pesaran, Shin, and Smith (1999), equation *(2)* can be expressed in the common autoregressive distributive lag (ARDL) $(p,q,...,q)$ dynamic panel specification form:

$$crime_{i,t} = \sum_{j=1}^{p} \lambda_{ij} crime_{i,t-j} + \sum_{j=0}^{q} \beta'_{ij} X_{i,t-j} + \mu_i + \varepsilon_{i,t} . \qquad (3)$$

For the $\varepsilon_{i,t}$ to be stationary, it must be the case that any nonstationary variables be cointegrated. We formally test for nonstationarity with the Hadri (2000) panel stationarity tests. For each variable, the null hypothesis of stationarity is rejected at the 1% significance level.[11] To evaluate if the variables are cointegrated, we employ the Kao (1999) test, an augmented Dickey-Fuller-type test applicable to panel data, as well as the

Table 3. Estimates of Property Crime Rates Using Alternative Income Inequality Measures, 1960 to 2004

	Top 5% Income Share (1)	Top 1% Income Share (2)	Top 90-99% Income Share (3)
$crime\ rate_{i,t-1}$	0.901*** (0.01)	0.902*** (0.01)	0.905*** (0.01)
$average\ police\ wage_{i,t}$	-7.383*** (2.44)	-8.221*** (2.42)	-9.261*** (2.43)
$prisoners_{i,t}$	-0.104*** (0.04)	-0.118*** (0.04)	-0.141*** (0.04)
$high\ school_{i,t}$	0.354 (0.29)	0.401 (0.29)	0.556* (0.29)
$college_{i,t}$	-1.770*** (0.44)	-1.882*** (0.44)	-1.940*** (0.44)
$unemployment_{i,t}$	1.474*** (0.43)	1.498*** (0.43)	1.523*** (0.43)
$real\ income\ per\ capita_{i,t}$	53.738*** (9.58)	52.570*** (9.56)	49.517*** (9.54)
$top\ income\ share_{i,t}$	-1.231*** (0.33)	-1.150*** (0.34)	46.177 (45.73)
R^2	0.965	0.966	0.966

*, **, ***: Significant at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses. All variables are mean-differenced to eliminate fixed-time effects.

Table 4. Long-Run Dynamic Panel Error-Correction Estimates of Property Crime Rates, 1960 to 2004

	Top 10% Income Share		Top 5% Income Share		Top 1% Income Share		Top 90-99% Income Share	
	Dynamic FE (1)	PMG (2)	Dynamic FE (3)	PMG (4)	Dynamic FE (5)	PMG (6)	Dynamic FE (7)	PMG (8)
$adjustment\ coeffiecient\ (\phi)$	-0.104*** (0.01)	-0.121*** (0.02)	-0.107*** (0.01)	-0.153*** (0.03)	-0.107*** (0.01)	-0.135*** (0.03)	-0.104*** (0.01)	-0.130*** (0.03)
$average\ police\ wage_{i,t}$	-77.541*** (26.99)	-109.879*** (17.27)	-69.650** (29.73)	-82.816*** (14.41)	-76.059*** (29.00)	-95.576*** (18.79)	-98.367*** (24.60)	-108.815*** (19.48)
$prisoners_{i,t}$	-0.660 (0.41)	-0.895** (0.36)	-0.600 (0.40)	-0.971*** (0.30)	-0.729* (0.44)	-0.593* (0.34)	-1.100** (0.53)	-0.998** (0.41)
$high\ school_{i,t}$	3.956 (2.51)	-1.647 (2.19)	3.094 (2.52)	2.307 (1.64)	3.363 (2.60)	9.288*** (2.11)	5.597** (2.23)	12.750*** (2.02)
$college_{i,t}$	-20.482*** (5.39)	-15.350*** (3.17)	-20.554*** (5.28)	-19.355*** (2.52)	-21.798*** (5.40)	-30.450*** (3.41)	-23.561*** (5.75)	-36.624*** (3.99)
$unemployment_{i,t}$	9.994** (4.96)	12.611*** (3.36)	10.635** (4.80)	11.001*** (2.76)	11.116** (4.67)	12.640*** (3.43	11.948** (4.79)	13.903*** (3.63)
$real\ income\ per\ capita_{i,t}$	533.711*** (113.92)	589.343*** (70.50)	552.248*** (115.25)	416.785*** (69.36)	541.422*** (116.43)	653.175*** (83.11)	519.968*** (121.43)	592.262*** (73.13)
$top\ income\ share_{i,t}$	-10.279*** (3.67)	-12.046*** (2.58)	-12.949*** (4.29)	-12.959*** (2.03)	-13.515*** (4.82)	-15.182*** (2.88)	1053.419 (665.73)	1280.651 (382.47)

*, **, ***: Significant at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses. All variables are mean-differenced to eliminate fixed-time effects. Dynamic FE is the dynamic fixed effects estimator; PMG is the pooled mean group estimator of Pesaran, Shin and Smith (1999).

Pedroni (1995, 2004) test, a pooled Phillips and Perron-type test for panel data. Note that cointegration is implied if a long-run relationship between the variables exists. With both of these cointegration tests, we reject the null hypothesis of no cointegration at the 1% significance level.[12]

Equation (3) can be re-parameterized into the error-correction equation:

$$\Delta crime_{i,t} = \varphi_i\left[crime_{i,t-1} - \theta_i' X_{i,t}\right] + \sum_{j=1}^{p-1}\lambda_{ij}\Delta crime_{i,t-j} + \sum_{j=0}^{q-1}\beta_{ij}'\Delta X_{i,t-j} + \mu_i + \tau_t + \varepsilon_{i,t} \quad (4)$$

where

$$\varphi_i = -\left(1 - \sum_{j=1}^{p}\delta_i\right), \theta_i = \sum_{j=0}^{q}\frac{\beta_{ij}}{1-\sum_k \lambda_{ik}}, \lambda_{ij} = -\sum_{m=j+1}^{p}\lambda_{im}$$

and $\beta_{ij} = -\sum_{m=j+1}^{q}\beta_{im}$.

The parameter φ_i is the error-correcting speed of adjustment term, the vector θ_i' captures the long-run relationships between the variables, while β_{ij}' captures the short-run relationships. One would expect the parameter φ_i to be significantly negative if the variables show a return to long-run equilibrium. If $\varphi_i = 0$, however, there would be no evidence for a long-run relationship. Since we are primarily interested in the nature of the long-run relationships, the long-run vector of coefficients θ_i' will be of particular importance.

Pesaran, Shin, and Smith (1999) have proposed estimating *(4)* with a pooled mean group estimator (PMG) that combines both pooling and averaging. Exploiting the unusual number of time-series observations available for each cross-section, the PMG estimator allows the intercepts, short-run coefficients and error variances to differ across states, but pools the data and constrains the long-run coefficients to be the same across states. Since equation *(4)* is nonlinear in the parameters, Pesaran et. al. (1999) develop a maximum likelihood (ML) method to estimate the parameters. Expressing the likelihood as the product of each cross-section's likelihood and taking the log yields:

$$l_T\left(\theta', \phi', \sigma'\right) = -\frac{T}{2}\sum_{i=1}^{N}\ln 2\pi\sigma_i^2 - \frac{1}{2}\sum_{i=1}^{N}\frac{1}{\sigma^2}\left(\Delta y_i - \varphi_i\xi_i(\theta)\right)' H_i\left(\Delta y_i - \varphi_i\xi_i(\theta)\right) \quad (5)$$

for $i = 1,2,...,N$, where $\xi(\theta) = y_{i,t-1} - X_i\theta_i$,
$H_i = I_T - W_i\left(W_iW_i\right)W_i$, I_T is the identity matrix of order T,
and $W_i = \left(\Delta y_{i,t-1},...,\Delta y_{i,t-p+1}, \Delta X_i, \Delta X_{i,t-1},...\Delta X_{i,t-q+1}\right)$.
The likelihood is maximized iteratively via back-substitution until convergence is achieved.

Table 4 presents the long-run estimates from the panel error-correction model in equation *(4)* using the common dynamic FE estimator, and the PMG estimator of Pesaran et. al. (1999). The eight models in Table 4 use these two estimators to evaluate the relationship between total property crime rates and four alternative top income share measures: the share of income of the top 10%, top 5%, top 1%, and top 90 to 99%. The Schwarz Bayesian Criterion is used to choose the appropriate number of lags. Across all of the estimations, the speed of adjustment parameter (φ) is consistently negative and statistically significant, indicating a return to long-run equilibrium in the model.

The long-run estimates using the error-correction model are remarkably consistent in sign and statistical significance to the annual dynamic fixed-effects estimates presented in Tables 2 and 3. Average police wage is again negatively related to property crime rates across all models, and the number of prison inmates is negatively related to property crimes in each of the PMG estimations. College attainment is associated with lower long-run crime rates in each of the models, while unemployment and real income per capita are associated with higher crime rates.

The negative relationship between the top decile's income share and property crime is again negative and statistically significant (columns 1 and 2). These results imply a long-run crime-inequality elasticity between -0.92 and -1.09. This relationship, however, again appears driven narrowly by income concentration within the very upper-end of the income distribution. Using the top 10% top 5%, and top 1% income share measures (columns 1 – 6), the relationship is negative and statistically significant. In the final two columns, when the top 90 to 99% income share is used, the relationship is statistically insignificant.

Small-T Panel Estimation

Since prior inequality studies have used large-*N*, small-*T* panels (e.g., Fajnzylber, et. al. 2002a, 2002b), one may question what impact the greater frequency of our panel has on the empirical estimates. To address this concern, Table 5 recasts our panel into five-year spacing spanning the period 1960 to 2000 (N = 48, T = 9). In columns 1, 3, 5, and 7 of Table 5, each of the four alternative inequality models from Table 2 (column 1) and Table 3 is re-estimated using the dynamic FE estimator.

The presence of lagged crime rates as a regressor in the dynamic FE estimations, however, means the fixed effects estimates of λ will be biased and inconsistent in small-T samples (see Judson and Owen 1999). This was less of a concern in the previous estimates, since Nickell (1981) has shown that in large-T samples the FE estimator is consistent, though still biased of order $1/T$. An alternative approach to eliminating μ_i is to first-difference equation *(2)*:

$$\Delta crime_{i,t} = \lambda\,\Delta crime_{i,t-1} + \beta'\Delta X_{i,t} + \Delta\varepsilon_{i,t} \quad (6)$$

where $\Delta crime_{i,t} = \left(crime_{i,t} - crime_{i,t-1}\right)$,
$\Delta crime_{i,t-1} = \left(crime_{i,t-1} - crime_{i,t-2}\right)$, and so on. Using $\Delta crime_{i,t-2}$ (or $crime_{i,t-2}$) as an instrument for $\Delta crime_{i,t-1}$, this becomes the first-differenced two-staged least squares estimator (FD-2SLS) suggested by Anderson and Hsiao (1981). Arellano and Bond (1991) note that the FD-2SLS estimator is consistent but not efficient since it fails to make use of all available moment conditions. Arellano and Bond propose estimating equation *(6)* with a generalized method of moments (GMM) estimator which utilizes as instruments for $\Delta crime_{i,t-1}$, lagged levels of endogenous and predetermined variables, and lagged first-

differences of exogenous variables. This differenced-GMM (or Dif-GMM) estimator has one and two-step variants, but the standard errors from the two-step estimator have been shown to be severely biased downward in small samples, and thus of little use for empirical inference (see Arellano and Bond 1991, and Blundell and Bond 1998). Recently, however, Windmeijer (2005) has developed a finite-sample correction for the two-step Dif-GMM estimator which provides more accurate inference.

Columns 2, 4, 6, and 8 in Table 5 re-estimate the four dynamic FE models with the Windmeijer (2005) corrected two-step Dif-GMM estimator. Average police wage and the number of prisoners are each treated as endogenous regressors. In general, the five-year panel framework produces dynamic FE estimates that are similar in sign and significance to the Windmeijer (2005) Dif-GMM estimates. The overidentifying test reported in the table is the Hansen *J* test statistic from the second step of the GMM estimation. This test statistic is insignificant at the five percent level in each of the estimations, indicating that the instrument sets are valid. Also reported in the table are tests for first and second-order autocorrelation: *autocorrelation1* and *autocorrelation2*. First-order autocorrelation is expected, but second-order autocorrelation would indicate that the lagged levels of the regressors are not valid instruments. The second-order autocorrelation tests are statistically insignificant in each estimation, indicating that the instrument sets are valid.

Across all estimations, crime rates again show strong inertia, as lagged crime rates are positively and significantly related to current crime rates. Average police wage, the prison population size, and college attainment are each negatively and significantly related to property crime rates. High school attainment, unemployment, and real income per capita are positively and significantly related to property crime. The three top income share measures of inequality (top 10%, top 5%, and top 1%) are each negatively related to property crime, while the top 90 to 99% share of income again shows no significant relation to property crime.

V. CONCLUSION

Theoretical research in economics has for long articulated a link between crime and income inequality. The rapid acceleration of income inequality in the 1980s and 1990s has placed even greater emphasis on understanding, as well as empirically verifying, the *ceteris paribus* effect of increased inequality on crime rates. This paper has offered an empirical investigation of the link between property crime and top income shares using a new panel of annual state-level inequality measures. Our panel is developed from IRS income data, which has enabled us to construct a panel that is large in both cross-sections and time periods ($N = 48$, $T = 45$), a first in the crime/inequality literature. We make full use of the flexibility and comprehensiveness of this new annual state-level panel by estimating the crime/inequality relationship through a variety of dynamic panel data estimation techniques, many of which follow from recent developments in the econometric literature.

Our analysis indicates that a high concentration of income in the upper-end of the income distribution is negatively related to property crime rates across a variety of estimation techniques, with a long-run crime-inequality elasticity near 1. Moreover,

Table 5. Five-Year Small-*T* Panel Estimates of Property Crime Rates, 1960 to 2000

	Top 10% Income Share		Top 5% Income Share		Top 1% Income Share		Top 90–99% Income Share	
	Dynamic FE (1)	Dif-GMM (2)	Dynamic FE (3)	Dif-GMM (4)	Dynamic FE (5)	Dif-GMM (6)	Dynamic FE (7)	Dif-GMM (8)
$crime\ rate_{i,t-1}$	0.546*** (0.04)	0.444*** (0.08)	0.539*** (0.04)	0.436*** (0.07)	0.538*** (0.04)	0.433*** (0.07)	0.554*** (0.04)	0.448*** (0.07)
$average\ police\ wage_{i,t}$	-47.557*** (12.99)	-83.713*** (22.30)	-46.553*** (13.04)	-83.517*** (22.54)	-47.941*** (13.05)	-81.302*** (27.68)	-54.668*** (12.85)	-90.079*** (22.47)
$prisoners_{i,t}$	-0.584*** (0.20)	-0.558*** (0.21)	-0.607*** (0.20)	-0.522*** (0.19)	-0.647*** (0.20)	-0.584*** (0.19)	-0.734*** (0.20)	-0.691*** (0.18)
$high\ school_{i,t}$	4.056*** (1.46)	4.107*** (1.33)	4.089*** (1.45)	4.298*** (1.29)	4.267*** (1.45)	4.716*** (1.40)	5.083*** (1.42)	4.959*** (1.68)
$college_{i,t}$	-6.825*** (2.30)	-6.885* (3.54)	-7.448*** (2.27)	-8.190*** (2.81)	-7.586*** (2.27)	-9.430*** (3.00)	-7.711*** (2.34)	-8.274** (3.33)
$unemployment_{i,t}$	12.024*** (2.05)	15.569*** (2.19)	12.177*** (2.05)	15.722*** (2.33)	12.281*** (2.05)	15.938*** (2.28)	12.659*** (2.06)	16.347*** (2.39)
$real\ income\ per\ capita_{i,t}$	187.317*** (47.54)	130.734* (71.67)	199.865*** (48.24)	155.129** (64.20)	191.235*** (47.99)	160.972** (65.65)	171.192*** (47.88)	133.371* (73.17)
$top\ income\ share_{i,t}$	-4.136*** (1.60)	-3.644** (1.73)	-3.996*** (1.47)	-3.850*** (1.29)	-3.425** (1.47)	-2.998** (1.49)	-16.856 (257.70)	-52.776 (332.96)
R^2	0.727	–	0.726	–	0.732	–	0.722	–
Overidentifying	–	42.27	–	41.22	–	42.49	–	43.07
Autocorrelation1	–	-3.44***	–	-3.42***	–	-3.45***	–	-3.40***
Autocorrelation2	–	-0.29	–	-0.06	–	-0.10	–	-0.39

*, **, ***: Significant at the 10%, 5%, and 1% levels, respectively. Standard errors are in parentheses. All variables are mean-differenced to eliminate fixed-time effects. Dynamic FE is the dynamic fixed effects estimator; Dif-GMM is the first-differenced GMM estimator of Windmeijer (2005). Overidentifying is the Hansen *J* test of overidentifying restrictions. Autocorrelation1 and Autocorrelation2 are tests for first-order and second-order serial correlation.

this relationship appears driven by income in the very upper-end of the income distribution. While a variety of top income share measures of inequality appear robustly related to crime rate, a measure that excludes the very upper end, such as the top 90 to 99% income share, shows no significant relation to property crime rates.

Though suggestive, our analysis is only one step in the empirical investigation of the crime/inequality relationship. Our analysis does not, for example, consider the impact of structural breaks in the state-level time-series, nor does it consider potential nonlinearities in the relationship between crime and top income shares. Our results also lack verification at panel aggregation levels both larger (e.g. cross-national) and smaller (e.g., cross-city, or cross-county) than the state-level aggregation we have relied upon.

A unique feature of this paper is the use of IRS income data for the construction of the top income share measures. IRS income data have the distinct advantage of being available annually for each state over the forty-five year period 1960 to 2004. Other existing state-level inequality panels are either restricted to only recent years, or contain only a very limited number of time-series observations for each state. IRS income data does have several important limitations, however, including the censoring of individuals below a threshold level of income. The omission of these individuals has forced our analysis to neglect the impact of income share changes from the lower and middle parts of the income distribution. It remains an important and open question what impact changes from these other parts of the income distribution have on property crime rates.

APPENDIX

A. Construction of the Inequality Measures

Our new panel of inequality measures are constructed using data published by the IRS on the number of returns and adjusted gross income (before taxes) by state and by size of the adjusted gross income.[13] Percentile rankings can be used to construct the top decile share of income. This construction is based on the split histogram interpolation method suggested by Cowell (1995), whereby the proportion of the population with income less than or equal to income y is defined as

$$F(y) = F_i + \int_{a_i}^{y} \varphi_i(x)\,\mathrm{d}x\,, \qquad (A.1)$$

where a_i is the lower bound of group i, and F_i is the cumulative frequency of the number of individuals before group i. The proportion of the total income received by those with income less than or equal to y is given by

$$\Phi(y) = \Phi_i + \frac{1}{\mu}\int_{a_i}^{y} x\varphi_i(x)\,\mathrm{d}x\,, \qquad (A.2)$$

where μ is mean income. The density within each interval i is defined by the split histogram density:

$$\varphi_i = \begin{cases} \dfrac{f_i(a_{i+1}-\mu_i)}{(a_{i+1}-a_i)(\mu_i-a_i)}, & \text{for } a_i \le x \le \mu_i \\ \dfrac{f_i(u_i-a_i)}{(a_{i+1}-a_i)(a_{i+1}-\mu_i)}, & \text{for } \mu_i \le x \le a_{i+1} \end{cases} \qquad (A.3)$$

where f_i is the relative frequency of n_i within group i, and a_{i+1} is the upper bound of group i.

B. Construction of the Human Capital Measures

Annual human capital attainment measures for each of the states are not available for the entire period 1960 to 2004. The Census Bureau provides state-level attainment measures for each state, but these are available only at ten year increments. The March supplement to the CPS provides full state-level attainment information only for the years 1989, 1991, and 1993 – 2004. In addition, the March CPS provides partial attainment information for the largest 15 states for the years 1979, 1981, 1983, 1985, 1987, and 1988.

To build an annual state-level measure of human capital attainment, we follow the spirit of the perpetual inventory method proposed by Barro and Lee (1993, 1996, 2000). Attainment information from the Census and March CPS is used as benchmark human capital stocks, while the number of new graduates each year are used as flows added to the current stock of human capital. Additionally, each year's stock is adjusted for mortality and net migration. Accordingly, we construct two human capital attainment-to-population ratios for each state:[14]

$$high\ school_{i,t} = \frac{h_{i,t}}{n_{i,t}} = \frac{\left(n_{i,t-1} - d_{i,t} + m_{i,t}\right)\ high\ school_{i,t-1} + \tilde{h}_{i,t}}{n_{i,t}} \qquad (B.1)$$

and

$$college_{i,t} = \frac{c_{i,t}}{n_{i,t}} = \frac{\left(n_{i,t-1} - d_{i,t} + m_{i,t}\right)\ college_{i,t-1} + \tilde{c}_{i,t}}{n_{i,t}}, \qquad (B.2)$$

where $h_{i,t}$ is the total number of individuals with at least a high school diploma in state i for year t, $c_{i,t}$ is the total number of individuals with at least a baccalaureate or first professional degree, $\tilde{h}_{i,t}$ is the number of new high school graduates, $\tilde{c}_{i,t}$ is the number of new bachelor or first professional degrees conferred, $d_{i,t}$ is the number of deaths, and $m_{i,t}$ is net migration (the number of new arrivals into a state minus the number that have left the state).

The assumption from equations *(B.1)* and *(B.2)* is that the number of deaths and net migration are independent from the level of schooling attained. Though not entirely accurate, this assumption is necessary given data limitations, and similar to the assumption made by Barro and Lee (1993, 1996, 2000).

Net migration $\left(m_{i,t}\right)$ is not known on an annual basis for each state, but may be inferred, since, the change in population from period $t-1$ to period t must equal the number of new births, minus the number of deaths, plus net migration:

$$n_{i,t} - n_{i,t-1} = b_{i,t} - d_{i,t} + m_{i,t}\,. \qquad (B.3)$$

Rearranging equation *(B.3)* and substituting into equations *(B.1)* and *(B.2)*,

$$high\ school_{i,t} = \frac{\left(n_{i,t} - b_{i,t}\right)\ high\ school_{i,t-1} + \tilde{h}_{i,t}}{n_{i,t}} \qquad (B.4)$$

and

$$college_{i,t} = \frac{\left(n_{i,t} - b_{i,t}\right)\ college_{i,t-1} + \tilde{c}_{i,t}}{n_{i,t}}. \qquad (B.5)$$

Equations *(B.4)* and *(B.5)* may then be used to construct forward-flow and backward-flow estimates of human capital attainment for the missing cells (55.7% of the sample).[15] As a rule, we choose the flow estimate that minimizes the distance from a Census or March CPS benchmark. For the year 1967, for example, the backward-flow estimate is used since the 1970 Census benchmark is closer than the 1960 benchmark. In years where the backward-flow and forward-flow estimates are equal distances apart (e.g. 1965), an average of the two is used.

To evaluate the accuracy of the perpetual-inventory method, we estimate attainment over the period 1979 to 2004 using only the Census benchmark information (1980, 1990, and 2000), and compare these values to the actual attainment information provided in the March CPS. The root mean square error for actual and estimated high school attainment is 0.022, and 0.013 for college attainment. Following Barro and Lee (1993), we can further assess this accuracy using the Theil U statistic, a measure bound between zero and one, with larger values indicating poor forecasting performance. Over this period, the Theil U statistic for high school attainment is 0.043, a magnitude substantially less than the secondary attainment measures of Barro and Lee (0.14 to 0.36). Similarly, the Theil U statistic for college attainment is 0.087, a magnitude less than the higher attainment measures of Barro and Lee (0.10 to 0.25). Both values indicate that the two attainment measures provide a good fit for the period sampled, though the high school attainment measure performs better than the college attainment measure. It is plausible that this difference in relative performance reflects the greater mobility of college graduates vis-à-vis high school graduates, a tendency we are unable to account for.

NOTES

1. The relationship between violent crime and income inequality is similarly ambiguous. While Doyle, Ahmed, and Horn (1999) found no significant relationship, Imrohoroglu, Merlo, and Rupert (2004) and Fajnzylber, Lederman, and Loayza (2002a, 2002b) find that higher inequality increases violent crime rates.

2. Prior research has been limited to either U.S. time-series data (Imrohoroglu et. al. 2004; Allen 1996), strictly cross-sectional samples (Kelly 2000), or large-N, small-T panels (Fajnzylber, et. al. 2002a, 2002b; Doyle et. al. 1999)

3. Deininger and Squire (1996) offer a large cross-national panel of inequality measures containing several time-series observations for each nation spaced over multiple decades. Similarly sized U.S. state-level inequality panels can be constructed from decennial U.S. Census data. Annual state-level panels encompassing recent years can be constructed using the March *Current Population Survey* (see for example, Doyle, et. al. 1999).

4. This new panel of annual state-level income inequality measures may be obtained online at www.shsu.edu/eco_mwf/inequality.html.

5. These measures are taken from the FBI's Uniform Crime Reports available at the web site of the Bureau of Justice Statistics. Burglary is defined as the unlawful entry into a structure to commit a felony or a theft, and includes attempted forcible entry. Larceny-theft is defined as the unlawful taking, carrying, leading, or riding away of property from the possession or constructive possession of another. Attempted larcenies are also included. Robbery is the taking or attempted take anything of value from the care, custody, or control of a person or persons by force or threat of force or violence and/or putting the victim in fear.

6. Recent years in these series are available at the web page of Emmanuel Saez.

7. The Theil U statistic varies between zero and one, and is analogous to an R^2 measure, though large values indicate poor performance.

8. Police payroll expenditures and annual police employment data are taken from annual issues of the *Sourcebook of Criminal Justice Statistics, the Statistical Abstract of the United States,* the Census Bureau's web site, and annual issues of *Public Employment.* Payroll expenditures are deflated by the Consumer Price Index, 2004 =100. Beginning in 1997, these data reflect payrolls from the month of March. Prior to 1997, these data reflect payrolls from October of the prior calendar year.

9. Prison populations are taken from Langan (1988), and yearly issues of the *Statistical Abstract of the United States.* Since these data reflect prison population at the end of the year (December 31st), we follow Levitt (1996) in using a one year lag.

10. State-level unemployment rates are taken from annual issues of the *Statistical Abstract of the United States*. Real state income per capita is taken from the Regional Accounts Data available at the web site of the Bureau of Economic Analysis, and deflated using the Consumer Price Index (2004 = 100).

11. The Hadri (2000) panel unit root test statistics for property crime rate, average police wage, prison population, high school attainment, college attainment, unemployment rate, log real income per capita, and top 10% share of income are: 114.02, 47.67, 150.91, 77.23, 36.09, 64.03, 96.65, and 110.16, respectively. Each of the tests statistics is statistically significant at the 1% level.

12. The Kao (1999) test statistic for the null hypothesis of no cointegration is -6.12, while the Pedroni (1995, 2004) test statistic is -28.85. Each is statistically significant at the 1% level.

13. For the years 1960 to 1973, and 1975 to 1981, the data are available in the *Statistics of Income, Individual Income Tax Returns* annual series. The 1974 volume of this series was never published, but the data are available from the 1974 edition of *Statistics of Income: Small Area Data.* Data for the years 1982 to 1987 were tabulated by the IRS, but never included in any of the publicly available IRS publications. Upon our request, however, Charles Hicks with the IRS graciously provided the data. For the years 1988 to 2004, the data are available in the *Statistics of Income Bulletin* quarterly series.

14. The population 25 and older, an more intuitive denominator, is not available annually at the state-level for the entirety of the sample period.

15 The annual number of college graduates (bachelor's and first professional degrees) and public high school graduates are taken from annual issues of the *Digest of Educational Statistics, the Biennial Survey of Education,* and the *Statistical Abstract of the United States.* The year 1961 was undocumented, and thus had to be linearly interpolated. The number of live births and total population are available from annual issues of the *Statistical Abstract of the United States.*

REFERENCES

Akhand, Hafiz, and Haoming Liu. 2002. Income Inequality in the United States: What the Individual Tax Files Say. *Applied Economics Letters* 9 (4, October):255-59.

Allen, Ralph C. 1996. Socioeconomic Conditions and Property Crime. *American Journal of Economics and Sociology* 55 (3, July):293-308.

Anderson, T. W., and Cheng Hsiao. 1981. Estimation of Dynamic Models With Error Components. *Journal of the American Statistical Association* 76 (375, September): 598-606.

Arellano, Manuel, and Stephen Bond. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies* 58 (2, April):227-97.

Baltagi, Badi H. (2005). *Econometric Analysis of Panel Data.* Third. England: John Wiley & Sons.

Barro, Robert J., and Jong-Wha Lee. (1993). International Comparisons of Educational Attainment. *Journal of Monetary Economics* 32 (3, December):363-94.

Barro, Robert J., and Jong-Wha Lee. (1996). International Measures of Schooling Years and Schooling Quality. *American Economic Review* 86 (2, May):218-23.

Barro, Robert J., and Jong-Wha Lee. (2000). *International Data on Educational Attainment: Updates and Implications*. CID Working Paper No. 42. Center for International Development at Harvard University.

Baum, Sandy. (1992). Poverty, Inequality, and the Role of Government: What Would Adam Smith Say? *Eastern Economic Journal* 18 (2, Spring):143-56.

Becker, Gary S. (1968). Crime and Punishment: An Economic Approach. *Journal of Political Economy* 76 (2, March-April): 169-217.

Bjorvatn, K., and A. W. Cappelen. (2003). Inequality, Segregation, and Redistribution. *Journal of Public Economics* 87 (7-8, August):1657-79.

Blundell, Richard, and Stephen Bond. (1998). Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. *Journal of Econometrics* 87 (1, November):115-43.

Chiu, W. Henry, and Paul Madden. (1998). Burglary and Income Inequality. *Journal of Public Economics* 69 (1, July):123-41.

Cowell, Frank A. (1995). *Measuring Inequality.* London School of Economics Handbooks in Economics Series, no. Second. Prentice Hall, Harvester Wheatsheaf.

Deininger, Klaus, and Lyn Squire. (1996). A New Data Set Measuring Income Inequality. *The World Bank Economic Review* 10 (3, September):565-91.

Doyle, Joanne M., Ehsan Ahmed, and Robert N. Horn. (1999). The Effects of Labor Markets and Income Inequality on Crime: Evidence from Panel Data. *Southern Economic Journal* 65 (4, April):717-38.

Ehrlich, Isaac. (1973). Participation in Illegitimate Activities: A Theoretical and Empirical Investigation. *Journal of Political Economy* 81 (3, May-June):521-65.

Ehrlich, Isaac. (1996). Crime, Punishment, and the Market for Offenses. *Journal of Economic Perspectives* 10 (1, Winter): 43-67.

Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza. (2002a). Inequality and Violent Crime. *Journal of Law and Economics* 45 (1, April):1-40.

Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza. (2002b). What Causes Violent Crime. *European Economic Review* 46 (7, July):1323-57.

Freeman, Richard B. (1996). Why Do So Many Young American Men Commit Crimes and What Might We Do About It? *Journal of Economic Perspectives* 10 (1, Winter):25-42.

Gilbert, Geoffrey. (1997). Adam Smith on the Nature and Causes of Poverty. *Review of Social Economy* 55 (3, Fall): 273-91.

Glaeser, Edward, Jose Scheinkman, and Andrei Shleifer. (2003). The Injustice of Inequality. *Journal of Monetary Economics* 50 (1, January):199-222.

Gottschalk, Peter. (1997). Inequality, Income Growth, and Mobility: The Basic Facts. J*ournal of Economic Perspectives* 11 (2, Spring):21-40.

Hadri, Kaddour. (2000). Testing for Stationarity in Heterogeneous Panel Data. *Econometrics Journal* 3 (2): 148-61.

Imrohoroglu, Ayse, Antonio Merlo, and Peter Rupert. (2004). What Accounts for the Decline in Crime? *International Economic Review* 45 (3, August):707-29.

Judson, Ruth A., and Ann L. Owen. (1999). Estimating Dynamic Panel Data Models: A Guide for Macroeconomists. *Economics Letters* 65 (1, October):9-15.

Kao, Chihwa. (1999). Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics* 90 (1, May):1-44.

Kelly, Morgan. (2000). Inequality and Crime. *The Review of Economics and Statistics* 84 (4, November):530-39.

Krueger, Alan B. (2003). Inequality, Too Much of a Good Thing. In *Inequality in America: What Role for Human Capital Policies?* ed. James J. Heckman and Alan B. Krueger, 1-75. Cambridge: MIT Press.

Langan, Patrick A. (1988). *Historical statistics on prisoners in state and federal institutions yearend 1925-86.* Washington D.C.: U.S. Dept. of Justice, Bureau of Justice Statistics.

Lee, Daniel Y., and Stephen J. Holoviak. (2006). Unemployment and Crime: An Empirical Investigation. *Applied Economics Letters* 13 (12, October):805-10.

Levitt, Steven D. (1996). The Effect of Prison Population Size on Crime Rates: Evidence From Overcrowding Litigation. *Quarterly Journal of Economics* 111 (1, May):319-51.

Nickell, Stephen J. (1981). Biases in Dynamic Models with Fixed Effects. *Econometrica* 49 (6, November):1417-26.

Olson, Mancur. (1971). T*he Logic of Collective Action: Public Goods and The Theory of Groups.* Cambridge, Massachusetts: Harvard University Press.

Pedroni, Peter. (1995). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests, with and Application to the PPP Hypothesis. Indiana University Working Papers in Economics.

Pedroni, Peter. (2004). Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Test with an Application to the PPP Hypothesis. *Econometric Theory* 20 (3, June):597-625.

Pesaran, M. Hashem, Yongcheol Shin, and Ron P. Smith. (1999). Pooled Mean Group Estimation of Dynamic Heterogeneous Panels. *Journal of the American Statistical Association* 94 (446, June):621-34.

Pesaran, M. Hashem, and Ron Smith. (1995). Estimating Long-Run Relationships from Dynamic Heterogeneous Panels. *Journal of Econometrics* 68 (1, July):79-113.

Piketty, Thomas, and Emmanuel Saez. (2003). Income Inequality in the United States, 1913-1998. *Quarterly Journal of Economics* 118 (1, February):1-39.

Samavati, Hedayeh. (2006). Economics of Crime: Panel Data Analysis of Bank Robbery in the United States. *Atlantic Economic Journal* 34:455-66.

Smith, Adam. (1978). *Lectures on Jurisprudence.* Glasgow Edition of the Works and Correspondence of Adam Smith. Ed. R. L. Meek, D. D. Raphael and P. G. Stein. Oxford University Press.

Thorbecke, Erik, and Chutatong Charumilind. (2002). Economic Inequality and Its Socioeconomic Impact. *World Development* 30 (9, September):1477-95.

Windmeijer, Frank. (2005). A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators. *Journal of Econometrics* 126 (1, <ay):25-51.

Witt, Robert, Alan Clarke, and Nigel Fielding. (1998). Crime, Earnings Inequality, and Unemployment in England and Wales. *Applied Economics Letters* 5 (4, April):265-67.

RE-EXAMINING FELDSTEIN-HORIOKA FOR THE NAFTA COUNTRIES: A TIME SEGMENTED PANEL COINTEGRATION APPROACH

Swarna Dutt, University of West Georgia
Dipak Ghosh, Emporia State University

1. INTRODUCTION

A seminal study of the relationship between domestic investment (I) and domestic saving (S) is the Feldstein-Horioka (1980, F-H henceforth) paper. They contended that domestic savings would be translated into domestic investments, which would imply low international capital mobility. The idea being that for every country the dictum "our money finances our investment" would be true. In terms of modern econometric analysis it would imply that if the domestic S and I (both expressed as a ratio of GDP) were cointegrated, then domestic savings is being channelized into domestic investment, and hence there is low capital mobility amongst countries. in this topic was the F-H (1980) paper which correlated the domestic S/I relationship with international capital mobility. In their Economic Journal (1980) study they looked at 16 OECD countries data in a cross sectional set up, between 1960–74. There is ample empirical evidence to suggest a high positive correlation between I and S.

Now for closed economies (autarkies) this may be true, but it need not be so for open economies where international capital could be an alternative conduit to finance domestic investment. This should be true to a large extent since in the last quarter century capital has become very mobile, especially among similarly situated (economically, politically, culturally socially etc.) developed countries.

Real world experience suggests that in today's electronic world where information dissemination is instantaneous and money transfer (even in bulk) can be done within seconds and at low transaction costs. Thus countries could raise money from international capital markets where the cost of capital is the lowest. But the empirical evidence still suggests a high S/I ratio.

With increasing allocative efficiency and the lowering of per unit transaction costs, capital should be more and more mobile over time. The real world provides ample evidence of ever increasing capital mobility among countries, especially among the developed economies, like the OECD countries and the European Union.

So why would empirical evidence still point to a high S/I correlation and hence low capital mobility? This begs the question "is this an indicator of low capital mobility or is the F-H hypothesis as postulated, not a good indicator of capital mobility?"

The results from the extant literature are all over the board. There seems to be a conceptual contradiction alive and kicking. There is no reason for capital not to be mobile among developed economies. They are all stable economies and informational efficiency is at its highest level ever with instantaneous electronic transfers. This is the reason why Obstfeld and Rogoff (2000) identify this as one of the six major puzzles in the area of international macroeconomics.

This topic is highly researched because academics/researchers/practioner's are not able to reconcile the contrary evidence between high domestic S/I ratios and the highly efficient international capital markets out there, use of which should indicate high capital mobility. Since the literature is far from unanimous on this topic, we wanted to revisit this controversy with a different approach and in the process possibly shed some additional light.

We propose to analyze the S/Y and I/Y ratios using the Pedroni (2001a, b, 2004) panel cointegration technique for the NAFTA countries in a time segmented approach. We divide the test time periods into the entire time frame (1960-2013) and the post NAFTA time frame (1994-2013.) The countries of course are Canada, Mexico and the United States, and we use savings, investment and GDP data for each country. We believe this should help shed some additional light on the relationship between these ratios.

2. LITERATURE REVIEW

The first significant study in this topic was the F-H (1980) paper which correlated the domestic S/I relationship with international capital mobility. They looked at 16 OECD countries data in a cross sectional set up, between 1960–74. Their estimated the regression was:

$$(I/Y) = \alpha + \beta\,(S/Y) + \mu \qquad \text{eq. (1)}$$

where S/Y is the savings GDP ratio, I/Y is the investment GDP ratio, β is the saving- retention coefficient and μ the error term. The F-H correlation is based on the economic rationale that high capital mobility would imply low conversion of domestic savings into domestic investment, since savers would be facing the same world interest rates. But conversely if capital mobility is low, that will drive a wedge between domestic and foreign borrowing costs.

Based on eq, 1, F-H found β the saving-retention coefficient to be "not significantly different from 1" indicating low capital mobility. This is so because β is measured as the proportion of incremental saving invested domestically. If international

capital mobility is perfect, β would be close to zero. Thus very little home investment is financed by foreign money, i.e., international capital mobility is very low. This may be because borrowers have a home country bias (when deciding the source of their funding) which is indeed an accepted norm in international economics. But logic dictates that with increasing allocative efficiency and lowering of per unit transaction costs, capital should be more and more mobile over time.

Next Feldstein (1983) reported similar results. The disconcerting fact was that at the same time there was evidence of the world capital markets getting more and more deregulated, with increasing purchasing power parity and capital allocation being made based on interest rate differentials among economies. These all indicate an increasing degree of capital mobility, hence it was dubbed a puzzle.

The degree of capital mobility is important from the economic development and long run growth point of view also. Efficient capital markets can make the much needed funds available to developing and underdeveloped economies. This would result in lower per unit loan costs, thus helping in consumption-smoothing, helping in ones monetary and fiscal policy applications and also help economies cope with sudden exogenous shocks.

But the real world provides ample evidence of ever increasing capital mobility among countries, especially among the developed economies, OECD countries and the European Union. So why would the empirical evidence still point to a high S/I correlation and hence low capital mobility?

Well many reasons have been proposed for this. One line of reasoning states that if both S and I are driven by factors like the growth rate of the economy, the betterment in income distribution and the endogeneity of savings, they would be strongly correlated, even though they may actually be unrelated. Since none of these factors were considered by F-H, according to O, 1986 this could result in a misspecified econometric model with omitted variables, and / or simultaneous equation bias, all of which would bias the statistical values of β.

To get a flavor of the state of the literature, let us look at the results of just a few of the studies done over the last 3 decades, using both time series and cross-sectional techniques. Dooley, Frankel and Mathiesen (1987) found results consistent with the original F-H study. But Bayoumi (1990) contrarily found indication of high capital mobility as evidenced through liberalization of domestic financial markets and dismantling of capital controls. Given this dichotomy Krol (1996) contented that the F-H results were dependent on the estimation techniques used, namely that fixed-effect panel regression had a downward bias.

Obstfeld (1986) used 70 OECD countries and found the S/I correlation to be significantly different from 1, implying low capital mobility. Miller (1988) found S/I cointegrated, hence indicative of low capital mobility, but only under the fixed exchange rate system for USA. Gulley (1992) found opposite results, especially when a constant was included in the equation. Jansen (1996, 1997) found strong S-I correlation, but this was due to a strong inter-temporal budget constraint effect. He contends that it is this effect which answers the F-H puzzle.

Then we have Coakley, Fuertes and Spagnolo (2003) who also finds a high S/I correlation, implying low capital mobility. Levy (2004) using post war US data (and a neoclassical inter-temporal budget constraint model) finds I/S to be cointegrated, but contends that this is not a good indicator of the degree of international capital mobility.

Starting with the 1980's, international capital mobility has increased by leaps and bounds. All indicators point in this direction. The US stock market crash of 1987 was almost instantaneously transmitted around international markets. The huge and ever increasing Foreign Direct Investment (FDI) from OECD countries to the emerging economies and portfolio investment across countries, all point to an ever increasing direction of international capital mobility. Also on the bureaucratic side, more and more government barriers are going down, with increasing deregulation and the increasing efficiency of international capital markets. In spite of this, the evidence in the literature on the F-H hypothesis is mixed and hence dubbed a puzzle.

Since the variables (S/GDP) and (I/GDP) show characteristics akin to unit roots, and so cointegration analysis can be applied. Thus a number of recent studies have used cointegration processes to evaluate this relationship.

Adey (2003) use the original F-H regression for 21 OECD and European Union countries from 1970-2000. They broaden the definition of the S/I terms to resolve the "inherent endogeneity" in the original specification. To this end they start off with a "simultaneous equation model" and then move to "panel estimation techniques." Their results confirm the F-H hypothesis with similar results (80–100 % correlation range) or high correlation between S and I.

Then we have Bebezuk and Schmidt-Hebbel (2006) who use 16 OECD country data between 1973-2003, with sector level economic regression, done by breaking the country into household, corporation and government data. They find a β coefficient of 0.5, but once the sectoral coefficients are considered, β gets close to zero, implying a high degree of capital mobility.

Next Caporale, Panopoulou and Pitts (2007) use 23 OECD countries data, and find little evidence supporting the F-H hypothesis.

3. DATA DESCRIPTION

We estimate and test models of cointegration for the United States, Mexico, and Canada using the saving/GDP and Investment/GDP ratios. All data was obtained from the OECD Quarterly National Accounts database. All data is quarterly. Data for Canada, Mexico and the USA is from 1960, quarter 1 to 20013 quarter 1.

4. PEDRONI'S PANEL COINTEGRATION TESTS

One point of concern has been the power of traditional cointegration tests. It has been pointed out that the power of these tests depends more on the span of the data rather than the number of observations. For example, if we consider a time span of 1980 to 2005, moving from annual to quarterly to monthly data will not appreciably increase the power. An example would be to use daily instead of weekly data or weekly data in place of monthly data. This increases the number of observations, but that does not necessarily increase the strength of the results.

Increasing the time span of the variable series increases its credibility, but in reality it is a difficult proposition. The time span availability of the variables is not dependent on the researcher's discretion. On the other hand if one blindly increases the data time span, the test strength will possibly increase but one could very well have introduced major policy shifts and structural economic changes. An example of this would be using pre-war and post-war data together, just to increase the time span.

On the other hand if increasing the time span of the data is not a practical solution (additional data may not be available, or it may introduce structural changes in the model) one alternative is to consider additional cross-sectional data instead of a longer time period, thus resulting in panel data.

Pedroni (2004) proposes the following way of testing for cointegration in a panel. He proposes the following regression:

$$y_{it} = \alpha_i + \delta_i t + \beta_i X_{it} + e_{it} \qquad \text{eq. (2)}$$

where i= number of cross sections, and t= number of time periods. The variables y_{it} and X_{it} are assumed to be I(1) for each member I of the panel, and under the null hypothesis of "no cointegration" e_{it} will also be I(1). The parameters α_i and δ_i allow for differences between cross sections. The slope coefficient may also be different between cross sections. Pedroni (2004) proposes a set of residual based test statistics for the null of "no cointegration" which do not assume that the slope coefficient is the same in all cross sections.

One remedy to solve this dilemma has been proposed by Pedroni (2001 a, 2001 b, and 2004) where he introduces similar cross-sectional data over the available time period. This pooling of similar data will help in the above stated situation. One example would be where he pooled data from economically similar countries to study PPP (Pedroni, 2004.) The problem here is that simple pooling of time series data would involve "in model" heterogeneity. Here he has constructed "panel cointegration" test statistic (Pedroni , 2004) which allows for one to vary the degree of heterogeneity among the panel members.

Moreover Pedroni (1995, 1997, and 2001 a) has done residual based tests for the null of "no cointegration" for heterogeneous data. In Pedroni (2004) he extends the same test to include heterogeneous dynamics and slope coefficients. It examines both the between dimension and within dimension residuals. The strength of this test is that the resultant "test statistic" is able to accommodate short run dynamics, deterministic trends and also different slope coefficients. This test statistic is "standard normal' and free of nuisance parameters. Asymptotic properties of the cointegration unit root statistic. The starting point is the standard equation:

$$y_{it} = \alpha_i + \delta_i t + \beta_i X_{it} + e_{it} \qquad \text{eq. (3)}$$

Where y_{it} = relevant variable where i = 1, 2….N observations and t = 1, 2….T time periods.

X_{it} = m-dimensional column vector for each member i

t= time period under consideration

and

β_i = m-dimensional row vector for each member i

First we test for the order of integration (non-stationarity) of the raw data series y_{it} and x_{it}. They are integrated of order one i.e., I(1.) The null is of no cointegration with an I(1) error structure. Here α_i, δ_i and β_i are allowed to be heterogeneous.

The null is
H_o: Panel series are not cointegrated.

versus the alternative
H_A: Panel series are cointegrated.

Here when we are pooling different data series, the slope coefficient β_i will not be of a common slope across different data series. If forcefully a common slope coefficient is imposed (in spite of the true slopes being heterogeneous) the residuals of the data series whose slope differs from the others will be stationary, although in truth they may be cointegrated.

The strength of these pooled tests is that the slope coefficients are not constrained to be the same, but rather allowed to be heterogeneous (i.e., allowed to vary across individual data series.) Below are the results of the tests distributional properties:

1) The standard central limit theorem (CLT) is assumed to hold for each individual series, as the time span grows. The advantage here is that the error structure includes all auto regressive moving average (ARMA) processes.

2) The matrix structure is (m+1) x (m+1) in size where the off diagonal entities Ω_{2li} capture the feedback between the regressors and the dependent variable. This is the invariance principle.

3) Also cross sectional independence or process i.i.d. (independent and identically distributed) is assumed. This allows for the application of the standard CLT even in the presence of heterogeneous errors. Here $\Omega_i > 0$ ensures that there is no cointegration between y_{it}. The invariance and cross sectional independence help construct the asymptotic properties

of the test statistic. It allows the test statistic to converge asymptotically to the actual values.

$$T^{-2} \sum_{t=1}^{T} z_{it-1} z'_{it-1} \Rightarrow L'_i \int_0^1 Zi(r)\, Z_i(r)' \, d_r L_i \text{ ---- eq. (4)}$$

$$T^{-1} \sum_{t=1}^{T} z_{it-1} \xi'_{it} \Rightarrow L'_i \int_0^1 Z_i(r)\, d\, Z_i(r)' \, dr\, L_i + \Gamma_i \text{ -- eq. (5)}$$

These convergence results hold under standard assumptions. The assumption of sectional independence allows for "averaging" over the cross sectional sums of the panel statistic. Moreover it also reduces the effect of "nuisance parameters" due to serial correlation in the data as $T \to \infty$. This makes the computation a lot simpler. It also has another distinct advantage. Applying the limit $T \to \infty$ results in higher order terms being eliminated prior to "averaging," leaving only the first order terms of the time series.

He considers two class of statistics. The first pools the residuals of the regression "within panel dimensions" and the second pools the residuals "between panel dimensions." Here he gives the example of how $Z\rho_{NT}^{-1}$ in equation (6):

$$Z\rho_{NT}^{-1} \equiv (\sum_{i=1}^{N} A_{22i})^{-1} \sum_{i=1}^{N} (A_{21i} - T\hat{\lambda}_i) \text{ ---------- eq. (6)}$$

is analogous to the semi parametric "ρ" of the PP (1988) and PO (1990). Similarly in equation (7) and (8):

$$^{Zv\hat{}}NT \equiv L\hat{}^2_{11} (\sum_{i=1}^{N} A_{22i})^{-1} \text{ ---------- eq. (7)}$$

$$^{Zt\hat{}}NT \equiv (\tilde{\sigma}^{-2}_{NT} \sum_{i=1}^{N} A_{22i})^{-1/2} \sum_{i=1}^{N} (A_{21i} - T\hat{\lambda}_i) \text{ - eq. (8)}$$

Where $^{Zv\hat{}}NT$ and $^{Zt\hat{}}NT$ stand for "panel variance ratio statistic" and "panel t statistic" respectively, which are the same used in PO (1990.) Then equations (9) and (10) below pool the data "between panel dimension" to compute the group mean of the time series.

$$\tilde{Z}_{\rho NT}^{-1} \equiv \sum_{i=1}^{N} A_{22i}^{-1} (A_{21i} - T\hat{\lambda}_i) \text{ ---------- eq. (9)}$$

and

$$^{Zt\hat{}}NT \equiv \sum_{i=1}^{N} A_{22i})^{-1/2} \sum_{i=1}^{N} (\hat{\sigma}_i^2 (A_{21i} - T\hat{\lambda}_i) \text{ -- eq. (10)}$$

Pedroni (2004) then demonstrates the asymptotic distribution of the residual based tests for the null of "no cointegration" in heterogeneous panels. His results are fairly general and assumes 'only finite second moments." These results apply to all cases using the generalized format of equation (1) and for any number of regressors, when we measure the slope coefficients separately for each panel data series.

He also conducts Monte Carlo simulations to study the small sample properties of the 'statistic' for different panel dimensions. It also includes the consequences of the time series dimensions growing (over time) and at different rates for different variables. He demonstrates excellent convergence of the "t" statistic (as "T" increases beyond 150 observations) keeping N fixed. Then he keeps "T" fixed and varies "N." As the index becomes larger and larger the convergence properties becomes more stable. He also studies the strength and stability of his test statistic against various 'alternative hypotheses." Now regarding the data generating process, it is

$$y_{it} = x_{it} + e_{it}$$

where

$$e_{it} = \text{ø} e_{it-1} + \eta_{it}$$

and

$$\Delta x_{it} \sim N(0,1)$$

$$\eta_{it} \sim N(0,1)$$

ø = {0.9, 0.95, and so on…} The alternative hypothesis here is that the residuals e_{it} is stationary. They use the autoregressive (AR) process, rather than a moving average (MA) error correction process. They test the empirical power of their test statistic at the 5% level. They also include different combinations of panel dimensions for N and T. The tests are powerful enough to show that using monthly data with more than 20 years of observations, it is quite easily possible to distinguish the cases from the null of "no cointegration" when the data is pooled. Moreover the Monte Carlo simulations show that:

Case 1: For small panels, the group-rho statistic rejects the null of 'no cointegration."

Case 2: For large dimensional panels, the panel –v statistic has the best power. The other statistics lie in between the two extremes of case 1 and case 2.

He then applies the test to the case of the PPP hypothesis. If PPP holds, the cointegration slope (βi) of the equation

$$s_{it} = \alpha_i + \beta_i p_{it} + e_{it} \qquad \text{eq. (11)}$$

where, s_{it} is the nominal exchange rate for country i time t, β_i slope coefficient of each individual country I, p_{it} is the log price level differential between the two country's (in this case country i and the USA) and e_{it} is the error structure. The test is set up as such:

1) Null of no cointegration country wise

and

2) panel and group mean statistics for the null of no cointegration.

Pedroni is a residual based test of the "null of no cointegration" hypothesis to estimate the slope coefficients across a panel of countries. The biggest advantage of this procedure is that it takes into consideration heterogeneous effects and economic deterministic trends. The test statistic is asymptotically "normal" and free of "nuisance parameters." His application to test the PPP hypothesis is the one being used by us here in the set of NAFTA countries.

5. EMPIRICAL RESULTS

The S/Y and I/Y ratios for each of the countries are tested for the presence of unit roots, and all series are found to have unit roots (the results are not included in the paper as they are standard results). We then proceed to apply the Pedroni (2004) tests, which is a test of the null hypothesis that all the individuals in the panel are not cointegrated against the alternate hypothesis that a significant portion of the individuals are cointegrated. We also go on to estimate the Pedroni (2001a) Fully Modified OLS (FMOLS) and Dynamic OLS (DOLS) tests which test whether the coefficient of the cointegrating equation is equal to one, which would imply an absence of capital mobility as described in F-H (1980).

The results give in table 1 are for the Pedroni (2004) tests and there is weak evidence in favor of cointegration between the countries as in 5 out of 8 cases we are unable to reject the null hypothesis (H_0: all countries in the panel are not cointegrated) in favor of the alternative hypothesis (H_1: a substantial portion of the countries in the panel are cointegrated). This is evidence against the Feldstein-Horioka hypothesis existing among the G-5 members in the period 1960-2010.

The results in table 2 are for the Pedroni (2001a) test which is carried out on a data set which is cointegrated and the null hypothesis is that the coefficient in the cointegrating equation is equal to one, which would be evidence against the F-H (1980) hypothesis as F-H stated that even for developed countries the coefficient should be about 0.10. The null hypothesis is rejected in all cases indicating that there is evidence in favor of the F-H hypothesis. However, due to our inability to find strong evidence that the is cointegration between the Investment-GDP and Saving-GDP ratios, the evidence from the Pedroni (2001a) test is suspect and requires further investigation.

CONCLUSION

We have looked at the relationship between the saving-GDP and investment-GDP rations for three countries, U.SA, Mexico, and Canada. The evidence indicates that the ratios are cointegrated for these countries. A previous study by the authors indicated some evidence in favor of threshold cointegration for these three countries (using different time periods). This would tend to imply that there is very little capital mobility between these countries and domestic investment is primarily funded by domestic savings. What is interesting is that once NAFTA

Table 1:

S/Y and I/Y: tests for Panel Cointegration, full time period (1960, Q1 – 2009, Q3)

	ν-stat	Rho-stat	t-stat	ADF-stat
Panel Statistics				
Standard	4.6512*	-2.5999*	-1.5383*	-1.6639*
Time demeaned	5.2222*	-3.7222*	-2.0775*	-2.3917*
Group Statistics				
Standard		-1.5814*	-1.1695*	-1.3587*
Time demeaned		-2.6137*	-1.7895*	-2.1592*

NOTE: All reported values are distributed as N (0,1) under the null hypothesis. An asterisk indicated rejection of the null hypothesis at the 10% level or higher.

Table 2:

S/Y and I/Y: tests for Panel Cointegration, post NAFTA (1994, Q1 – 2009, Q3)

	ν-stat	Rho-stat	t-stat	ADF-stat
Panel Statistics				
Standard	0.1614	0.7666	1.1568	0.8094
Time demeaned	0.0976	0.9739	1.6931*	0.6469
Group Statistics				
Standard		1.4447	1.8198*	1.1645
Time demeaned		1.6225*	2.4327*	1.2491

NOTE: All reported values are distributed as N (0,1) under the null hypothesis. An asterisk indicated rejection of the null hypothesis at the 10% level or higher.

was approved, evidence in favor of the Feldstein-Horioka hypothesis vanishes. I would seem that the trade agreement increased capital mobility among the three NAFTA members. This is not surprising as we would expect increased trade to lead to increased capital mobility among these countries, particularly between USA and Mexico. Testing for that is left as a topic for future research.

REFERENCES:

Adey, H.A., (2003), "An investigation into the Feldstein-Horioka puzzle: Does the puzzle persist" Department of Economics, Final Report, Georgetown University.

Bayoumi, T., (1990), "Saving-investment correlations: Immobile capital, government policy or endogenous behavior" IMF Staff Papers, 37 (2), pp.

Bebczuk, R. and Schmidt-Hebbel, K., (2006), "Revisiting the Feldstein-Horioka puzzle: An institutional sector view" MPRA Paper # 1802.

Caporale, G.M., Panopoulou, E. and Pittis, N., (2007), " The Feldstein-Horioka puzzle revisited: A Monte-Carlo study" University of Piraeus Working Paper.

Coakley, J., Fuertes, A and Spagnolo, F., (2003), "The Feldstein-Horioka puzzle is not as bad as you think" Money Macro and Finance Research Group Conference Paper, 17, pp. 1-21.

Dooley, M., Frankel. J and Mathieson, D., (1987), "International capital mobility. What do saving-investment correlations tell us?" IMF Staff Papers, 34, pp.503-30..

Feldstein, M. and Horioka, C. (1980), "Domestic saving and international capital flows" The Economic Journal, 90, pp. 314 -29.

Feldstein, M., (1983), "Domestic saving and international capital movements in the long run and the short run" European Economic Review 21, 129–151

Gulley, O. (1992), "Are savings and investments cointegrated: Another look at the data" Economics Letters, 39, pp. 55-58.

Jansen, J., (1996), "Estimating saving-investment correlations: evidence for OECD countries based on an error correction model" Journal of International Money and Finance, 15, pp. 749-81.

Jansen, J., (1997), "Can the inter-temporal budget constraint explain the Feldstein-Horioka puzzle" Economics Letters, 56, pp. 77-83.

Krol. R., (1996), "International capital mobility: evidence from panel data" Journal of International Money and Finance, 15 (3), pp. 467-74.

Levy, D., (2004), "Is the Feldstein-Horioka puzzle really a puzzle?" in *Aspects of Globalization: Macroeconomic and Capital Market Linkages in the Integrated World Economy,* ed. by C. Tsoukis, G. Agiomirgianakis and T. Biswas. Published by Kluwer Academic Publishers, 2004.

Miller, S.M. (1988), Are saving and investment cointegrated" Economics Letters, 27, pp. 31-34.

Obstfeld, M., (1986), "Capital mobility in the world economy" Carnegie-Rochester Conference Series on Public Policy, 24, pp. 55-104.

Obstfeld, M. and Rogoff, K., (2000), "The six major puzzle sin international macroeconomics: is there a common cause? NBER Working Paper # 7777.

Pedroni, Peter, (1995), "Panel Cointegration: Asymptotics and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis," Indiana University Working Papers in Economics, 95-013.

Pedroni, Peter, (1997), "Panel Cointgration: Asymptotics and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis: New Results, Indiana University Working Papers in Economics.

Pedroni, Peter, (2001 a), "Panel Cointgration: Asymptotics and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis," revised Working Paper, Indiana University.

Pedroni, Peter, (2001 b), "Purchasing Power Parity tests in cointegrated panels, Review of Economics and Statistics 83, pp. 727-31.

Pedroni, Peter, (2004), "Panel Cointgration: Asymptotics and Finite Sample Properties of Pooled Time Series Tests with an Application to the PPP Hypothesis," Econometric Theory, Vol. 20, No. 3, pp. 597-625.

THE ECONOMIC IMPACT OF A SMALL UNIVERSITY AND ITS ATHLETIC PROGRAM ON THE REGIONAL ECONOMY: A CASE STUDY

Yoshi Fukasawa, Midwestern State University
John E. Martinez, Midwestern State University

INTRODUCTION

There are two basic views regarding the effects of athletics on institutions of higher education. One view suggests that athletic programs are a net benefit generating a variety of direct and indirect benefits for the school sponsoring them. Many school officials rely on stories about the surge in applications that accrue to schools with winning sports teams to justify significant increases in athletic spending.[1] A contrasting view suggests that athletic programs impose substantial financial and other costs on universities (Knight Commission, 2001). However, much of the empirical evidence on the effects of college athletics have essentially relied on a narrow subset of schools, with the research mostly focused on Division I schools. Since college athletic programs vary significantly, it is our contention that it is impossible to lump all programs together when trying to undertake economic impact studies. Furthermore, most studies have had a limited scope, strictly focusing on the impact of athletic programs on the host university without much discussion about the impact those programs have on the broader regional economy. This paper is concerned with a slightly different issue: What is the economic impact of college athletics on the host region? More specifically, what impact do athletic programs sponsored by Midwestern State University (MSU) have on the regional economy?

STATEMENT OF PURPOSE

The purpose of this study is to conduct an economic impact analysis of Midwestern State University's athletic programs on the regional economy. Hosting a sporting event can result in a number of benefits to any region. There are many benefits, such as increasing community visibility and enhancing community image that are very important but very difficult to measure. But, aside from that difficulty, it is not always clear that sporting events that utilize public subsidies always bring positive economic benefits into communities. Because many sporting events in a community are likely financed by public tax support, economic impact studies continue to be an important public relations tool for local governments. Also, sporting events provide more than just entertainment value; they can also be viewed as an investment serving as a cornerstone for developing other business-related ventures.

LITERATURE REVIEW ON ECONOMIC IMPACT STUDIES

Economic impact is an important topic of discussion, but estimating the economic impact of a sporting event can be very difficult and frequently too subjective (Bourdieu, 1999). Although many previous studies have contributed to economic impact research of sport and/or recreational events, many studies are based upon the researchers' personal perception and often times questionable methodology. In this section, we will review previous economic impact studies with hope of avoiding many of the methodological pitfalls that have accompanied many of those studies.

The economic impact from sporting events is typically derived by estimating the overall change in economic activity resulting from such events. The resulting economic change results from activity involving the acquisition, operation, development, and use of sport facilities and services (Lieber & Alton, 1983). In turn, those initial investments generate visitors' spending, public spending, employment opportunities, and tax revenue. The economic impacts of expenditure are composed of direct, indirect, and induced effects where direct effects are the purchases needed to meet the increased demand of visitors for goods and services. Indirect effects come from additional rounds of re-circulating the initial spectators' dollars. Induced effects are the increases in household income that result from the economic activity fueled by the direct and indirect effects (Dawson, Blahna, & Keith, 1993; Howard & Crompton, 1995). Economic impact studies of sporting events are often controversial because of their subjective aspects. Based on the literature review, there are other problems as well. First, the use of different and conflicting concepts of the multiplier itself (Howard & Crompton, 1995) is a major problem. Economic impact studies are primarily used by consultants hired by sport entrepreneurs and boosters to demonstrate the value of a proposed sport event (Johnson & Sack, 1996). Secondly, inclusion of local spectators, time-switchers, and casuals in the study pose another serious problem.

Economic impacts attributable to sporting events should include only external flows injected into an economy by visitors and other external businesses such as media, banks, and investors from outside the community. In addition, because expenditures by time-switchers and casuals would have occurred without the event, impacts of their expenditures should be excluded in conducted economic impact study, especially if it is net economic effects that are being estimated. Often times only gross benefits rather than net benefits are measured and reported. Thirdly, economic impact studies by hired consultants often estimate only positive aspects, ignoring potential economic costs. In the case of non-economic impact, negative social impacts including such possibilities as traffic congestion and disruption of residents' lifestyle are rarely reported. Finally, the results and

their interpretations could be changed based on the intent of the researchers and the unrealistic expectations of proponents.

Many economic debates often center on the appropriateness of the size and type of multipliers used for conducting economic impact analysis. The multiplier effect accounts for the overall economic impact of a sporting event. The multiplier effect demonstrates the process through which initial spending in a region generates further rounds of re-spending within the region. The basic principle of the multiplier effect begins with an initial spending as an increased income into an economy. A portion of the increased income is spent and further re-spent within the region (Archer, 1984; Crompton, 1995; Wang, 1997). In summary, there are three elements that contribute to the total impact of visitor spending. Direct impacts result from first-round effect of visitor spending or initial community investments. Indirect impacts come from the ripple effect of additional rounds of re-circulating the initial dollars spent. And induced impacts stem from further ripple effects caused by employees of impacted business spending some of their salaries and wages in other business in the host community (Howard & Crompton, 1995). A variety of multiplier used modeling techniques are available.

Among the more popular are RIMS II (Regional Input-output Modeling System, version II developed by Wang, 1997) and IMPLAN (Impact Analysis for Planning developed by Bushnell & Hyle, 1985; Dawson, Blahna, Keith, 1993; Donnelly, et al., 1998; Howard & Crompton, 1995; and Wang, 1997). The IMPLAN develops input-output models used to estimate the employment, income, and net sales for all states and counties in the United States. Another widely used model is RIMS II, which was developed by the U.S. Department of Commerce, Bureau of Economic Analysis. This model also offers input-output tables down to the county level. RIMS II multipliers examine the flows of goods and services among the disaggregated industries within the specified geographic market (Turco & Kelsey, 1992). And, because many of the formulas were developed to conduct economic impact studies of sporting events, RIMS II is the model of choice for this study.

Table 1 Sources of Revenue	
Net Tuition and Fees	**$ 30,074,871**
State Funds	**$ 30,789,624**
Federal Funds	**$ 12,558,524**
Private Funds	**$ 3,598,617**
Investment Income	**$ 766,675**
Auxiliary & Others	**$ 11,072,942**
Total	**$ 88,500,892**

Source: MSU Fiscal Year 2011 Financial Report

EMPIRICAL RESULTS

Higher education has a significant impact on the Texas economy, fueling the Texas economic engine with over $33 billion per year.[2] Likewise; a small university such as Midwestern State University (MSU) with its athletic program has a significant impact on the regional economy, boosting local incomes by over one third of a billion dollars in 2010. Considering that

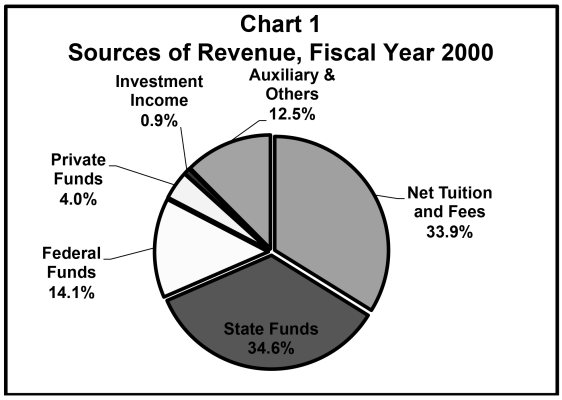


Table 2 MSU Economic Impact Academic Year 2010 – 2011	
The University	
Wages and Salaries	$37,412,149
Utilities, supplies, equipment, repairs, ... travel, payroll related costs, insurance	$35,763,457
Sub-Total	**$73,175,606**
Scholarship and financial aids	$10,258,815
Scholarship discounts and allowances	$10,365,096
Construction	$5,708,277
Sub-Total	**$26,332,188**
Total	**$99,507,794**
The Students	
Two regular semesters ($11,754 X 6,400)	$75,225,600
Summer Semester	$18,806,400
Sub-Total	**$94,032,000**
- Scholarship and financial aids	-$10,258,815
- Scholarship discounts and allowances	-$10,365,096
Sub-Total	**-$20,623,911**
Total	**$73,408,089**
The Visitors	
$138.34*34,840	$4,819,766
Total	**$4,819,766**
Grand Total	**$177,735,649**
Regional Multiplier	2.00
Regional Expenditures Impact	**$355,471,297**
Total Gross Regional Product	**$5,744,000,000**
Percent of Gross Regional Product	**6.2%**

the Wichita Falls MSA, composed of the Counties of Wichita, Archer, and Clay in the north Texas area, has a gross regional product of just under $6 billion, MSU accounts for a significant proportion (about 6.2%) of the area's gross regional product.

MSU generates its revenue of approximately $90 million annually from state funding, local tuition and fees, and other sources, as shown in Table 1. It is estimated that every dollar invested in MSU returns about $3.02 for the local economy.[3] This is a remarkable return, even for a private business venture. But when it comes to MSU or any other institution of higher education, the stakes are much higher. We are investing in our most important venture --- our workforce skills and thus the future viability of the regional economy.

This article summarizes the economic activity generated by Midwestern State University. The study is based on fiscal year 2011 (September 1, 2010 – August 31, 2011), which coincides with the academic year 2010-2011.
Midwestern State University, located in Wichita Falls, Texas, is a coeducational institution with approximately 6,400 students. The comprehensive university is made up of six colleges: business administration, education, liberal arts, science and mathematics, fine arts and health and human services. Each college offers both undergraduate and graduate (Master's) degrees.

Midwestern State University has several major sources of current operating revenues, used to pay for daily operations. Of $88.5 million in total resources available in fiscal year 2011, 34.8% was in the form of state funding; 34.0% net tuition and fees; and the remaining 31.2% from other sources, as shown in Chart 1. For each $1.00 the State of Texas invested in Midwestern State University, the University generated an additional $1.42 to cover its expenses from all other sources. The share of state funding has been declining significantly over the years. Just 10 years ago, state funding accounted for approximately 45% of the total revenue for the university.

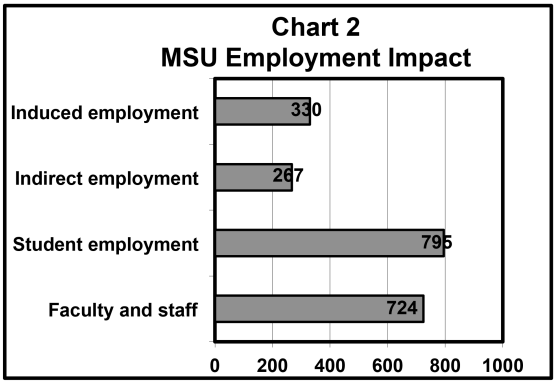
Midwestern State University makes an important direct economic contribution to the economy of the Wichita Falls area. During academic year 2010-2011, the university employed 724 faculty and staff members. Additionally, 795 part-time student workers were employed by the institution, giving a total of 1,519 employees, including faculty, staff, and students, on the payroll at MSU. During the same academic year, $37,412,149 was paid in the form of wages and salaries to these individuals. From September 2010 through August 2011, MSU spent approximately $35,763,457 for utilities, materials, supplies, equipment, repairs, travel, payroll related costs, and insurance. The total 2010-2011 university expenditures were $99,507,794, as shown in table 2.

In addition, MSU spent $10,258,815 for scholarships and financial aids during the same 12-month period. Scholarship discounts and allowances totaled $10,365,096 were provided for tuition exemptions.[4] Construction outlays during the year amounted to $5,708,277. MSU was responsible for direct expenditures of $94,032,000 for the 2010-2011 academic year.

The existence of Midwestern State University in Wichita Falls brings students to Wichita County. Furthermore, it keeps students in the Wichita Falls area who otherwise would have left to pursue their education or career preparation in other areas. A recent survey of students found that students spent, for everything other than tuition and fees, an average of $11,754 for two academic semesters.[5] The enrollment over the nine-month period in academic year 2010-2011 was 6,400 students. Total expenditures for the nine-month period by MSU students are estimated to have been approximately $75,225,600. The two summer sessions combined equal 20 percent of the total spending of the two regular semesters. The combined student expenditures for the academic year totaled $94,032,000. To avoid double counting, scholarship and financial aids in the amount of $10,258,815 was subtracted from the expenditures. Scholarship discounts and allowances in the amount of $10,365,096, were also deducted from the overall amount of expenditures, leaving the net total student expenditures of $73,408,089. Rough estimates show that during the academic year 2010-2011, there were 34,840 individuals from outside Wichita Falls who visited the Midwestern State University campus to attend various events, ranging from Artist/Lecture Series programs to the numerous sports events. Estimates are that each visitor spent $138.34, resulting in a total outlay of $4,819.766.[6]

Overall, Midwestern State University was responsible for expenditures totaling $177,735,649, as shown in table 2. It is estimated that the economic impact generated in the Wichita Falls area by Midwestern State University was, given the above assumptions of the expenditures and using the multiplier of 2.00, $355,471,297 ($177,735,649 x 2.00) during the academic year 2010-2011. The total economic impact of Midwestern State University represents approximately 6.2 percent of the total gross regional product of the Wichita Falls MSA. The economic impact of Midwestern State University on the Wichita Falls area is significant in another way. During academic year, the university employed 1,519 individuals, as shown in Chart 2. Through the employment multiplier effect, the university is responsible for an additional 597 indirect and induced jobs in the Wichita Falls area. The university also contributed, directly and indirectly, to the tax revenue of the Wichita Falls Independent School District, the City of Wichita Falls, and Wichita County, as shown in Chart 3.

The athletic program plays an important role at the university and contributes significantly to the economic impact of the



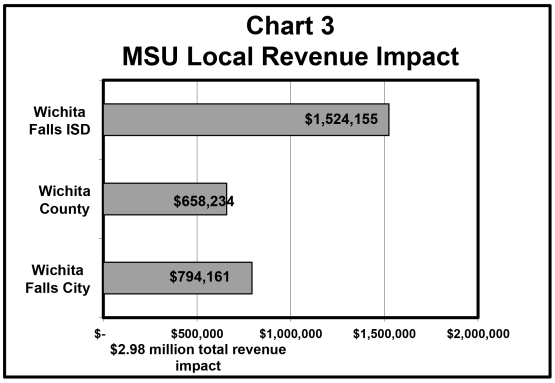


Table 3 MSU Athletic Economic Impact Academic Year 2010 – 2011	
The University	
Wages and Salaries	$1,887,689
Utilities, supplies, equipment, repairs, ... travel, payroll related costs, insurance	$2,702,201
Sub-Total	**$4,589,890**
Scholarship and financial aids	$1,423,942
Scholarship discounts and allowances	$1,438,694
Construction	$3,709,066
Sub-Total	**$6,571,702**
Total	**$11,161,592**
The Students	
Two regular semesters ($11,754 X 330)	$3,878,820
Summer Semester	$969,705
Sub-Total	**$4,848,525**
- Scholarship and financial aids	-$1,423,942
- Scholarship discounts and allowances	-$1,438,694
Sub-Total	**-$2,862,636**
Total	**$1,985,889**
The Visitors	
$166.01*32,293	$5,360,961
Total	**$5,360,961**
The Induced Students	
Number of program induced students	104
Economic Impact of induced students	$ 5,782,920
Total	**$ 5,782,920**
Grand Total	**$24,291,362**
Regional Multiplier	2.00
Regional Expenditures Impact	
Regional Expenditures Impact	**$48,582,724**
Percent of the MSU Impact	**13.7**

university. It is estimated that every dollar invested in the MSU athletic program returns about $4.35 for the regional economy. Indeed, the MSU athletic program accounted for 13.7 percent of the total university economic impact in the academic year 2010-2011, as shown in Table 3.

The athletic program operating expenditures, excluding scholarships, were $4,589,890, 6.3 percent of the university total in the academic year 2010-2011. The total expenditures by the athletic program, including scholarships and construction amounted to $11,161,592, as shown in Table 3.

The athletic program attracts additional students to Midwestern State University. We had 248 scholarship athletes in the academic year 2010-2011. Wes estimate that an additional 104 students (induced students) came to the university because of the athletic program, making the total number of 352 students affiliated with the athletic program.[7] Some came because of the band, some came because friends play sport at the university, and some came just to have an opportunity to attend as a spectator to sporting events at the university. These students accounted for the net student expenditures of $1,985,889, as shown in Table 3.

Midwestern State University offers scholastic sports opportunities in many programs including football, basketball, volleyball, soccer, softball, golf, tennis, and cross country. Home games for these sports events attract many visitors to the campus. It is estimated the number of campus visitors to the athletic events to be over 32,000 with the expenditures of $5,360,961 during the academic year 2010-2011.[8] The induced students accounted for the economic impact of $5,782,920, giving the total athletic program impact of $24,291,362.[9] Using the multiplier of 2.00, it is estimated that the total regional expenditure impact of the athletic program at the university to be $48,582,724, approximately 13.7 percent of the university total economic impact.

CONCLUSIONS:

The economic impact of Midwestern State University on the local income, employment, and tax base is significant, as shown above. But, this does not tell the whole story. Because it is so difficult to measure, the analysis used in this study cannot account for many other intangible benefits of higher education, including the general advancement of knowledge and cultural enrichment of the community. The faculty and students of the university makes, for example, contributions to local culture—theater, music performances, museums, and art exhibitions, thereby improving the quality of life of all the residents in the Wichita Falls area. This study does not account for the university's function in attracting firms and workers from other communities, research and development spin-offs, development of small businesses, and the other economic development in the local economy. Midwestern State University, through its business centers, often serves as stimulus for economic development through such programs as "Idea Wichita Falls." The university also enhances the quality of the local workforce, thereby improving the competitiveness of the regional economic base. This study, furthermore, does

not provide an estimate of incremental lifetime incomes to the local areas. These "difficult-to-measure" contributions of the university to the community may turn out to be of more importance than the dollar amount estimated in this study.

NOTES:

1. For example, see "U-Md's Other Winning Team," *Washington Post,* December 27, 2001 and "20 Years Ago, Life Changed Forever at Clemson with National Title," *Scripps Howard News Service,* November 2, 2001.

2. Susan Combs, Texas Comptroller of Public Accounts, "The Economic impact of the State Higher Education System on the Texas Economy," in Window on State Government, February 2005, p. 1.

3. The number is derived from dividing $355,873,313 by $88,500,892 and subtracting the original spending of a $1.00.

4. Note that in the strict sense, scholarship discounts and allowances are potential income not collected and a non-expenditure item.

5. A survey of student expenditures was conducted in several classes to obtain the estimate.

6. The estimate is based on the survey conducted at various events sponsored by the university.

7. The approach and the multiplier used in this report are similar to those of earlier studies. See, for example, Louis J. Rodriguez and Yoshi Fukasawa, "The Economic Impact of Health Care Industry on the Wichita Falls, Texas, Metropolitan Statistical Area (MSA)," *Wichita Falls Medicine,* Vol. 18, Number 4, July-August 2003, pp. 14-15.

8. The student multiplier of 1.35 was used in this study, following R. M. Coats and K. C. Cox, "Economic Impact of NSU Athletics" (April 14, 2004), retrieved from http:www.slec.org/uploads/Economic Impact.pdf.

9. The estimates are based on the surveys of the visitors to various events on the campus.

REFERENCES

Archer, B. (1984). Economic impact: Misleading multiplier. Annals of Tourism Research, 11(4), 517-518.

Bourdieu, P. (1999). The state, economics and sport. In Dauncey, H., & Hare, G. France and the 1998 World Cup: The national impact of a world sporting event, (pp. 15-21). London, England: Frank Class Publishers.

Bushnell, R. C., & Hyle, M. (1985). Computerized models for assessing the economic impact of recreation and tourism. In D. V. Propst (Ed.), Assessing the economic impact of recreation and tourism. Asheville, NC: Southeastern Forest Experiment Station.

Crompton, J. L. (1995). Economic impact analysis of sports facilities and events: Eleven sources of misapplication. Journal of Sport Management, 9, 14-35.

Dawson, S. A., Blahna, D. J., & Keith, J. E. (1993). Expected and actual regional economic impacts of Great Basin National Park. Journal of Park and Recreation Administration, 11(4), 45-59.

Donnelly, M. P., Vaske, J. J., DeRuiter, D. S., & Loomis, J. B. (1998). Economic impacts of state park: Effect of park visitation, park facilities, and county economic diversification. Journal of Park and Recreation Administration, 16(4), 57-72.

Goldman, G., & Nakazawa, A. (1997). Determining economic impacts for a community. Economic Development Review, 15(1), 48-51.

Howard, D. R., & Crompton, J. L. (1995). Financing sport. Morgantown, WV: Fitness Information Technology, Inc.

Johnson, A. T., & Sack, A. (1996). Assessing the value of sports facilities: The importance of non-economic factors. Economic Development Quarterly, 10(4), 369-381.

Knight Commission, *Final Report of the Knight Commission on Athletics,* 2001.

Leiber, S. R., & Alton, D. J. (1983). Visitor expenditures and the economic impact of public recreation facilities in Illinois. In Leiber, S. R., & Fesenmeier, D. R. Recreation planning and management. State College, PA: Venture Publishing.

Turco, D. M., & Kelsey, C. W. (1992). Conducting economic impact studies of Recreation and parks special events. Washington, DC: National Recreation and Park Association.

Turco, D. M., & Navarro, R. (1993). Assessing the economic impact and financial return on investment of a national sporting event. Sport Marketing Quarterly, 2(3), 17-23.

Wang, P. C. (1997). Economic impact assessment of recreation services and the use of multipliers: A comparative examination. Journal of Park and Recreation Administration, 15(2), 32-43.

Midwestern Business and Economic Review

Manuscript Submission Guidelines

The *Midwestern Business and Economic Review* invites submission of original manuscripts and research by individuals in the public and private sector in the areas of economics and business administration. Of particular interest are topics dealing with issues relevant to Texas and the Southwestern United States. Each manuscript submitted is anonymously reviewed by members of the Editorial Review Board and *ad hoc* reviewers as needed. To meet the interest of a broad spectrum of the academic and business community, readability and expository clarity are considered essential in the review process.

All manuscripts submitted for review must meet the following guidelines

- The manuscript should be doubled spaced, 12 point Times New Roman, with 1" margins, and should not exceed fifteen pages, excluding tables, figures, and references
- The first page should include the title of the article and an abstract 50-75 words in length
- Endnotes are preferred over footnotes
- References should follow the *American Psychological Association* guidelines
- All tables and figures should be included on separate pages

A cover letter should be included with the submission containing the following:

- Title of the manuscript
- Name, degree, rank, and affiliation of each author
- Contact information for each author (mailing address, telephone number, and email address)

Four copies of each manuscript must be accompanied by a PC compatible electronic copy of the manuscript formatted in Microsoft® Word or rich-text (RTF) formats.

All manuscripts should be submitted to:

Editor, *Midwestern Business and Economic Review*
Bureau of Business and Government Research
Midwestern State University
3410 Taft Boulevard
Wichita Falls, Texas 76308-2099

Bureau of Business and Government Research
Midwestern State University
3410 Taft Boulevard
Wichita Falls, TX 76308-2099

ADDRESS SERVICE REQUESTED

Non-Profit Organization
U.S. POSTAGE
PAID
Permit No. 781
Wichita Falls, TX