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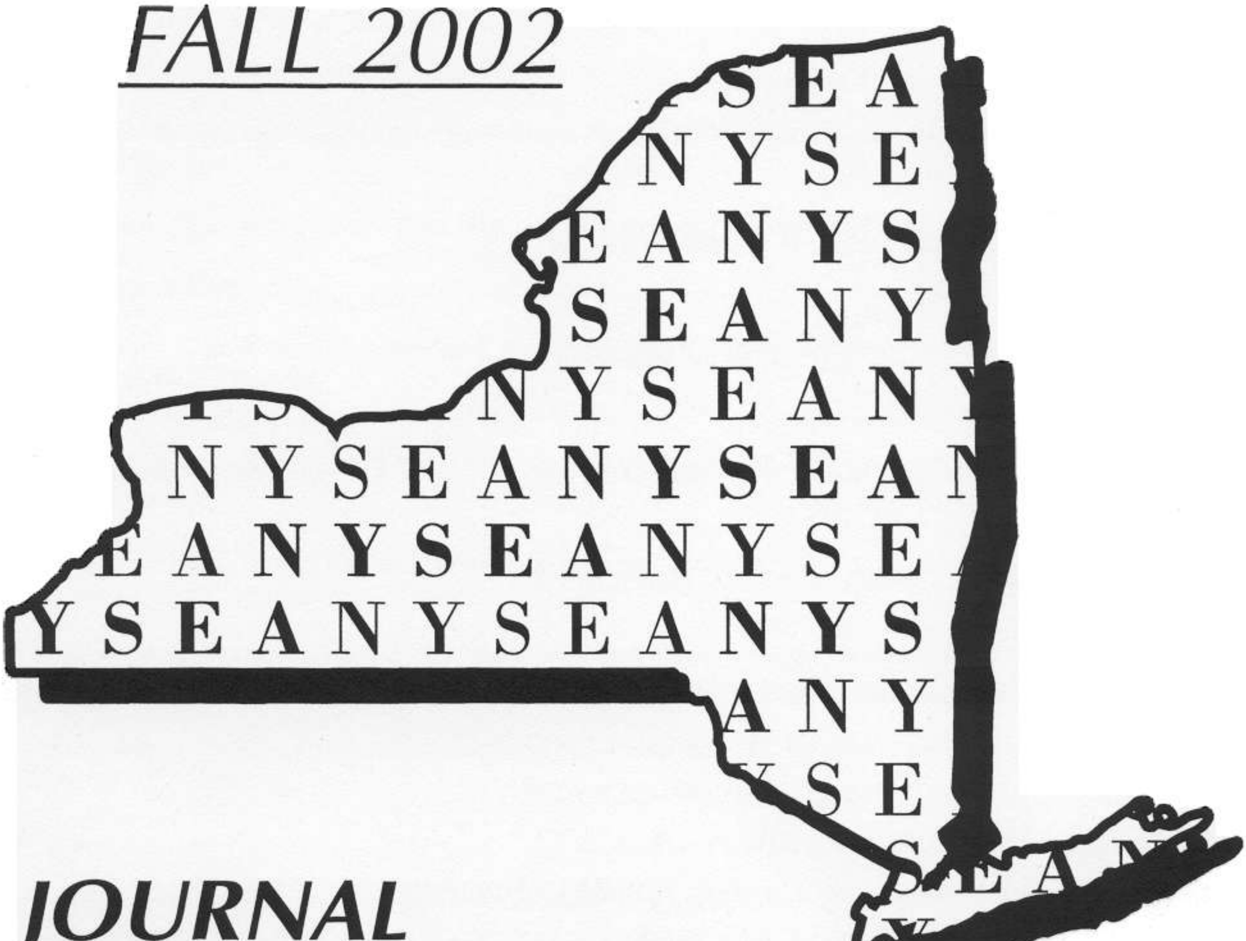

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EDITORIAL

The *New York Economic Review* is an annual journal, published in the Fall. The *Review* publishes theoretical and empirical articles, and also interpretive reviews of the literature. We also encourage short articles. The *Review's* policy is to have less than a three month turnaround time for reviewing articles for publication.

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A CORNER SOLUTION: COMMODITY FUTURES, DEFAULT FINES, AND UNINTENDED CONSEQUENCES

Wojtek Sikorzewski*

JEL classification: *G14*

ABSTRACT

We analyze one specific form of market manipulation - corners (or squeezes) in some commodity futures markets. In the analysis we focus on the role of institutional factors such as the storage capacity at the delivery point and the severity of fines imposed on defaulting shorts. We analyze the influence of these factors on the likelihood that a corner-style manipulation might occur.

A reduction in storage capacity or an increase in the amount of fines imposed on defaulting shorts increases the probability of the occurrence. However, the latter factor seems quiet paradoxical. A high level of fines in case of default on a futures contract should decrease the number of defaults and thus make a futures contract more reliable. But, it tends to make the corners more frequent and thus makes the futures contracts less useful for the hedgers.

Introduction

We analyze one specific form of market manipulation - corners (or squeezes) in some commodity futures markets. A corner may be defined as making contracts for the purchase of a commodity, and then taking measures that make it impossible for the seller to fill his contract, for the purpose of extorting money from him.

For this purpose, a squeezer takes a considerable long position with futures contracts and simultaneously buys huge quantities of the physical commodity on the spot (cash) market. In this way the squeezer is able to gain control (at least partially) of the available supply of the given commodity. At the maturity of the futures contract, the manipulator call for delivery of the commodity. Some of the shorts are not able to deliver the required commodity because they do not own it and the only person from whom they can get it is the dominant long - the manipulator. The "squeezed" shorts are therefore obliged either to accept any price set by the manipulator or to default on their contracts and pay a heavy fine set by the futures exchange governing body.

This type of manipulation was fairly frequent on the floors of commodity futures exchanges in the second half of the nineteenth century - especially on the Chicago Board of Trade (the CBOT).

In our historical analysis, we focus on the role of institutional factors such as storage capacity at the delivery point and the severity of fines imposed on defaulting shorts. We analyze the influence of these factors on the likelihood of occurrence of a corner-style manipulation.

In the first part of our paper we present a few cases of real corners dating from 1860 to 1885.

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Some of them, such as the corners orchestrated by B. Hutchinson in 1866 and in 1888, were very successful. Others, such as J. Lyon's in 1872 led their initiators to bankruptcy and complete ruin. In the second part of the paper, we try to model the mechanism of corners as a game between the manipulator and the hedgers - sellers of the contracts. This type of modeling tries to make existing models, those of Kyle(1984) and Pirrong (1995a) for instance, more realistic. These models emphasize the interplay between a manipulator and the market makers, which, in our opinion does not exactly reflects the reality.

Our first result is the absence of the pure strategy Nash-equilibria, which leads us to consider mixed strategy equilibria. This approach helps us to interpret the results in terms of probability. We can therefore compute the probability that a manipulator will attempt a corner and the probability that hedgers will enter in the futures market.

Our results are fairly intuitive. A reduction of storage capacity or an increase in the amount of fines imposed on the defaulting shorts increases the probability of the occurrence of corners. The latter factor seems paradoxical. The high level of fines in case of default on a futures contract should normally decrease the number of defaults and then make a futures contract more reliable. But, it tends to make the corners more frequent and thus make futures less useful for hedgers.

1.FEW HISTORICAL EXAMPLES

The nineteenth century could be described as the "golden age" of commodity futures manipulators. The exchanges' internal rules were very permissive (e.g. no position limits) and the directors boards were very unlikely to take important measures to curb any nascent corner. Furthermore, the regulatory constraints were virtually non-existent. [The first binding act of U.S. Congress –the Commodity Exchange Act - was enacted in 1922]. Thus, during this period we can observe the interactions of purely economic factors with no regulatory intervention. In this section we describe three cases[1] of attempted manipulation reported by W.G.Ferris (1988) and J.W.Markham (1987). Our intent is to provide some factual evidence of corners (two successful and one failure) in which institutional factors played an important role.

1.1. BENJAMIN P. HUTCHINSON IN 1866

Benjamin Hutchinson led one of the first attempts to manipulate the Chicago wheat markets. His goal was to squeeze the August 1866 wheat contract. Benefiting from weak harvest forecasts he built up a considerable long position in the cash grain and in futures contracts in May and June 1866. The average purchase cost of wheat was reported to be around 88 cents per bushel.[2] In August the price rose steadily following the reports of weak harvests in Illinois, Iowa and other states tributary to Chicago. On August 4, the wheat contract was quoted at $ 0.90 -$ 0.92.

On August 18, Hutchison's demands for delivery raised the wheat price to $1.85-$1.87 causing the shorts huge losses. This corner and the other squeezes that followed Hutchinson's example prompted the directors of the CBOT to proclaim such activities illegal. They gave the first definition of a corner determining it as the practice *« of making contracts for the purchase of a commodity, and then taking* *measure to render it impossible for the seller to fill his contract, for the purpose of extorting money from him ».* They deemed such transactions improper and fraudulent, and declared that any member of the CBOT who engaged in this type of transaction should be expelled from the board. These declarations, however, had no effect on actions undertaken by some traders in the following years. Some of these attempted corners did not succeed and led their initiators to bankruptcy and ruin.

1.2. JOHN LYON IN 1872

On October 6, 1871 a spectacular fire, known as "the Great Fire", destroyed a large part of the city of Chicago. Six out of seventeen regular[3] grain elevators burned down which considerably reduced the storage capacity in Chicago from around 8 million bushels to 5.5 million. An important wheat merchant, John Lyon, felt that it was a good moment to launch a corner on wheat. He formed a coalition with Hugh Maher, another grain dealer and P.J. Diamond, a CBOT broker.

In spring 1872 the group started buying wheat (physical and futures). The price of wheat kept rising during the spring and the August contract sold at the beginning of July for between $1.16 and $1.18 a bushel. It reached $1.35 by the end of the month. This price rise caused a massive expansion of wheat arrivals in Chicago. They averaged 14,000 bu. per day at the beginning of July and then steadily rose to 27,000 bu. a day during the first week of August. During this week, on August 5, one more elevator, "the Iowa Elevator", was destroyed by a fire, further reducing Chicago's storage capacity (by 300,000 bushels).

Furthermore, bad weather reports reinforced rumors that the new crop would mature too late for delivery against August contracts. This added to the buying pressure causing the contracts to reach $1.50 by August 10 and $1.61 by August 15.This was the peak of the operation.

News of such high prices in Chicago caused farmers to greatly accelerate the harvest. W. C. Ferris (1988) reports lanterns carried via railroads to enable farmers to harvest the grain at night. On their way back to Chicago the trains transported ever greater amounts of wheat. In the second week of August the daily arrivals averaged 75,000 bushel and on August 19 they reached the unexpected and astonishing level of 172,000 bushels. For the rest of August, estimated daily arrivals were between 175,000 and 200,000 bushels. At the same time, the normal commercial channels were reversed. Usually, wheat from Chicago was shipped via Buffalo to the West Coast cities. Because of shipping costs the wheat price in Buffalo was generally higher than in Chicago, but in August 1872 the Chicago price was high enough to make shippers transport wheat from Buffalo back to Chicago to sell it to Lyon.

In fact Lyon had to keep the price high, and therefore had to keep buying the grain coming to Chicago in order to make his corner succeed. But the amount of wheat coming to Chicago greatly exceeded his anticipations and his financial resources. He was then obliged to raise more money with local banks. Chicago bankers were unwilling to lend him additional resources. Furthermore new elevators, constructed after the Great Fire started operating. It was estimated that the storage capacity was raised to 10 million bushels, a level 2 million bushels higher than before the 1871 fire. This further stretched the financial resources of the Lyon's group.

Lyon kept buying the grain till the afternoon of Monday, August 19, but he stopped when he learned of the banks' refusal to support him. The price of wheat immediately fell 25 cents a bushel. On August 20, Lyon announced the breakdown of the corner which caused an additional price decrease of 17 cents per bushel. This collapse ruined J. Lyon, who was unable to redeem his debts. P. J. Diamond destroyed his books and disappeared.

Other corners, however, did not end with the ruin of their initiators. The corner launched by Benjamin Hutchinson in 1888 is considered one of the most successful corners ever attempted.

1.3. BENJAMIN P. HUTCHINSON IN 1888

In the 1880s Benjamin Hutchinson was a very respected trader. He was distinguished with the nickname "Old Hutch". In spring 1888 he began to accumulate physical wheat and futures contracts calling for delivery in September. It was estimated that he was able to accumulate the contracts and the wheat at a price averaging 87-88 cents per bushel. Hutchinson also controlled the biggest part of the wheat in store in Chicago. (Storage capacity was then estimated at around 15 million bushels.)

Hutchinson's buying was met by a group of professional traders following a "percentage short selling" strategy. They were selling at the start of each crop year in the hope that the price decline at harvest time would be sufficient to cover their short positions with profit. John Cudahy, Edwin Pardridge and Nat Jones were among the biggest short sellers. The September wheat contract market rapidly turned to be a battle between Hutchinson and the short sellers.

Until August the price of wheat was steady at around 90 cents per bushel. But then reports came to Chicago that a heavy frost had destroyed a big part of harvest in the northwest. At the same time the estimates of Europe's needs turned out to be very pessimistic. Europe's deficit was thought to be at around 140 million bushels creating a huge demand for the wheat, owned in large part by Hutchinson. In these circumstances the price of wheat kept rising and on September 22 it reached the psychologically important level of one dollar. Nevertheless, the shorts kept selling in the hope that Hutchinson would not be able to absorb the growing amounts of wheat and then retreat causing the prices to decline. Yet, Hutchinson kept buying the grain and the contracts.

On September 27 (three days before the contract expiration) September wheat opened at $1.05, kept rising during the day and reached $1.28 causing a panic between the small shorts who begged Hutchinson to sell them some of the contracts he owned. At that moment his market power was complete.[4]

He decided to offer them 125,000 bushels at $1.25. W.G. Ferris (1988) reports : *« "Let them have what they want at $1.25", Old Hutch told one of his brokers, John Brine. The shorts stood in line before Brine, who handed out 125, 000 bushels at $1.25. »*

Hutchinson had at that time the power to set any price for the contracts. On September 28 he fixed the price at $1.50 but the biggest shorts refused to settle. Next day (the last trading day) he then set the price of the contract at $2.00 which became the settlement price.

W. G. Ferris (1988) estimates that around a million bushels were delivered to Hutchinson and that another million bushels were in default. Given the average buying price we estimate his total profit from this operation at around $1.5 million.

The frequency of corners and the relative similarity of the strategies of different types of traders makes modeling of this phenomenon valuable. We present these situations as a game between the manipulator and the sellers. It is convenient to use this setup to show the role of some institutional factors, such as storage capacity and the default penalties, in the build up of squeezes.

2. MANIPULATION AS A GAME BETWEEN HEDGERS AND MANIPULATOR

2.1 DESCRIPTION OF THE MODEL

Three types of actors are involved in the model: the manipulator, the hedgers and the market makers, but only the first two act strategically. The game is an interplay between two players the manipulator and a representative hedger. This type of modeling tries to make existing models (Kyle(1984), Pirrong (1995a) more realistic. They put the emphasis on the interplay between a manipulator and the market makers, which, in our opinion, does not exactly reflect the reality.

The manipulator decides whether to launch the corner or not while the potential seller of the contracts decides whether to hedge with futures or not. The market makers set the price of the contract as a function of the observed order flow. The trading spreads over two periods. In period 0 the players decide whether to trade futures or not and in period 1 they observe the consequences of their strategies. We assume that there is only one delivery point where the storage capacity is limited to S. Furthermore we assume that, in case of the corner, the maximum price the manipulator can ask is limited to D which is the level of penalty imposed on the defaulting shorts by the futures exchange authority or other body governing futures trading.

2.1.1 THE PRICE

We assume that the commodity cash price in period 1, denoted by P_1^C is normally distributed with the expected value $E(P_1^C)$ and the variance σ^2_p:

$$E(P_1^C) \rightarrow N(E(P_1^C)), (\sigma^2_p)$$

The market makers' role is to set the price of contracts in period 0, P_0^F. This price equals the expected price in period 1 and is a function of the observed orders flow. We assume that the market makers are able to detect the presence of a manipulator when hedgers are not present in the market. Then they detect that the corner is launched and set the price at the period 0 at *D* - the same level as the manipulator asks in period 1. If they do not detect the presence of the manipulator they set the price in period 0 as a "normal" expectation of the price prevailing in the spot market in period 1 namely $E(P_1^C)$[5]:

$$P_0^F = \begin{cases} D & \textit{if manipulator is in the market} \\ E(P_1^C) & \textit{otherwise} \end{cases}$$

2.1.2 THE MANIPULATOR

We assume that the manipulator is risk-neutral. She has the choice between two strategies: to manipulate (*M*) or not to manipulate (*NM*), in which case she does not enter the market. If she does not manipulate, her profit, denoted by Π_M, is nil. Otherwise, in order to manipulate she has to buy in period 0 a large number of futures contracts *X* exceeding the storage capacity *S* at the point of delivery. Then she asks for delivery of *X* contracts. The maximum amount the shorts are able to deliver is limited by the storage capacity *S*. The manipulator takes delivery of this amount of the commodity at the cost of P_0^F and resells it on the spot market after delivery at the price P_1^L . She offers to sell the remaining contracts at a price of *D*. Her expected profit is therefore equal to:

$$E(\Pi_M)= (X - S) (D - P_0^F) + S P_1^L – S P_0^F$$

where:

$(X - S) (D - P_0^F)$	- profit from the defaulting shorts
$S P_1^L$	- revenue from the sale of the commodity delivered to her
$S P_0^F$	- cost of the delivered commodity

Furthermore we assume that the revenue from the sale of the commodity delivered to the manipulator SP_1^L is lower, due to the "burying the corpse effect", than the cost of the delivered commodity $S P_1^L < S P_0^F$.

For the sake of simplification we assume that the storage costs and the discount rate between the two periods are nil.

2.1.3 THE HEDGER

The hedgers are the producers of the commodity. Each of them produces *Q* units. The production costs are nil.

We assume that they are risk averse with a constant risk aversion coefficient *2a*. Their expected utility function is:

$$U(\Pi_H) = E(\Pi_H) - aVar(\Pi_H)$$

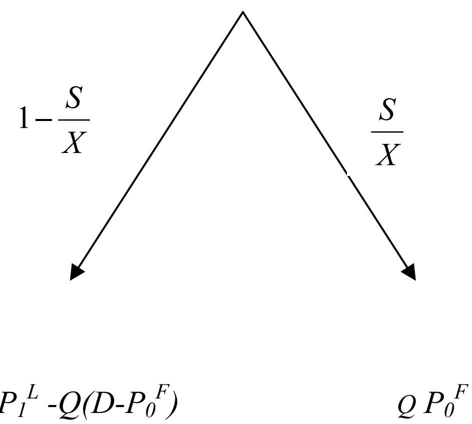
They have the choice between two strategies: to hedge (*H*) or not to hedge (*NH*) If they do not hedge their expected utility equals:

$$U(\Pi_H) = QE(P_1^L) - a\ Q2\sigma^2_p$$

If they hedge and if there is no corner their profit is constant and equals to QP_0^T which is also their expected utility. If they hedge and if there is a corner launched they can face two situations:

1. either they are able to deliver the commodity (with the probability *S/X* which depends on the proportion of the contracts held by the shorts which can be settled by the physical delivery out of the total deliveries required by the manipulator)
2. or they cannot deliver and then default because of the saturation of storage capacity. (with the probability *1-S/X*)

Their profit can be shown as follows:



The hedger's expected profit is:

$$E(\Pi_H) = \left(1-\frac{S}{X}\right)\left(QP_1^L - QD\right) + QP_0^F$$

and its variance is:

$$Var(\Pi_H) = \left(\frac{S}{X} - \left(\frac{S}{X}\right)^2\right)\left(QP_1^L - QD\right)^2$$

2.2. THE GAME

In the game, the strategies of two players, the manipulator and the representative hedger, are confronted. Both choose their strategies simultaneously. The profit of the manipulator depends on the price of the contracts in period 0 (P_0^F). If this price is low enough the manipulator's profit is positive:

$$E(\Pi_M) = (X - S)\ (D - P_0^F) + S\ P_1^L - S\ P_0^F$$

The contract's price in period 0 depends on the presence in the market of the two categories of players. If both are present, market makers are not able to detect the presence of the manipulator and thus the price set by them equals the expected spot price in period 1:

$P_0^F = E(P_1^C).$

If hedgers are absent from the market and if the manipulator is present, the market makers observe strong demand for the contracts and deduce that the corner is being launched and set the price for the contracts at the level of the default penalty - the price that will be demanded by the manipulator at the period 1:

$P_0^F = D.$

Then the manipulator makes a loss (due to "burying the corpse effect"):

$E(\Pi_M) = (X - S)(D - P_0^F) + S P_1^L - S P_0^F < 0.$

If the commodity producer does not hedge his expected utility equals:

$U(\Pi_H) = Q\, E(P_1^C) - a\, Q^2 \sigma^2_p$

which could be restated in the following manner:

$U(\Pi_H) = Q\, P_0^T - a\, Q^2 \sigma^2_p;$

Let us observe that during a corner the futures price is disconnected from the spot price. Given that the storage capacity is saturated at the delivery point, producers cannot sell their commodity on the spot market at the price *D*. This is because the potential buyers are not able to deliver the commodity against the futures contracts. Thus, the spot price remains unaffected by the rise of the futures price. In period 0 the expected utility of an unhedged producer remains the same and is independent of the manipulator's strategies.

In the case of manipulation the expected utility of a hedged producer depends on the probability of being able to deliver the commodity to the manipulator:

$$U(\Pi_H) = \left(1 - \frac{S}{X}\right)\left(QP_1^L - QD\right) + QP_0^T - a\left[\left(\frac{S}{X} - \left(\frac{S}{X}\right)^2\right)\left(QP_1^L - QD\right)^2\right]$$

which is less than her expected utility when there is no manipulation (QP_0^T).

Furthermore we assume that the hedger's expected utility is lower in the case of a corner (when she becomes a victim of the manipulator) than in the situation when she stays out of the futures market.

Given these assumptions we present the possible outcomes of the different strategies in the decision matrix displayed in Table 1:

Table 1. ***Manipulator's and hedger's decision matrix***

	M	NM
NH	$S P_1^L - S P_0^F$; $Q P_0^T - a Q^2\sigma^2_p$	0 ; $Q P_0^T - a Q^2\sigma^2_p$
H	$(X - S)(D-P_0^F) + S P_1^L - S P_0^F$ $(1-S/X)(QP_1^L - QP_0^F) + a[(S/X-(S/X)^2]\,(QP^L{}_1-QD)^2$	0 ; $Q P_0^F$

We observe that there is no pure strategy Nash-equilibrium in that game. If the manipulator chooses to initiate a corner the best hedger's strategy is to stay out of the market. In that case the manipulator makes a loss and therefore prefers not to enter in the futures markets. In that situation the producer would be better off hedging, but that would enable the manipulator to launch a corner and make a positive profit.

Proposition 1. *Recognizing that the pure strategy Nash-equilibrium does not exist, the players will turn to mixed strategies, i.e. they will determine the probabilities of using each of the strategies available. We define q as the probability that a commodity producer will hedge with futures contracts and p as the probability that a manipulator will initiate a corner. In equilibrium*:

$$q = \frac{S\left(P_0^T - P_1^L\right)}{(X-S)\left(D-P_0^T\right)}$$

and

$$p = \frac{aQ^2 o_p^2}{\left(1-\frac{S}{X}\right)\left(QD-QP_1^L\right)+a\left(\frac{S}{X}-\left(\frac{S}{X}\right)^2\right)\left(QP_1^L-QD\right)^2}$$

Proof: See Appendix 1.

The analysis of squeezes in probabilistic terms sets a convenient framework for determination of factors influencing the frequency of futures markets manipulation. We emphasize the role of penalty fines and storage capacity behind these attempts.

Result 1. *Intensity of hedging is directly proportional to storage space available and inversely proportional to amount of penalty fines, while probability of manipulation increases with this amount. The probability of manipulation increases also with spot price variability and and hedgers' risk aversion:*

$$\frac{\delta q}{\delta D} < 0$$

$$\frac{\delta q}{\delta S} > 0$$

and

$$\frac{\delta p}{\delta a} > 0$$

$$\frac{\delta p}{\delta o_p^2} > 0$$

$$\frac{\delta p}{\delta D} > 0$$

Proof: See Appendix 1.

The probability of hedging depends on two parameters, the default penalty paid by the shorts unable to deliver *D* and the storage capacity at the point of delivery *S*.

The higher the default penalty, the lower is the frequency of use of the futures markets by the commodity producers. In fact, the higher the level of *D*, the more profitable is the corner. That would encourage the manipulator to initiate corners more frequently, making the futures markets less attractive to the hedgers. Therefore the futures exchanges' governing bodies should set the default penalty at a reasonable level in order to promote hedging and discourage potential manipulators.

The interpretation of the influence of the storage capacity *S* on the hedging activity and on the probability of corners is quiet straightforward. The expansion of this capacity makes corners costlier and thus less frequent, which encourages producers to use futures markets for hedging purposes.

We also observe that the probability of manipulation depends on the coefficient of risk aversion of the hedgers. In fact the more risk averse they are, the more likely they are to enter the futures market, providing the manipulator with the needed "cover" to successfully launch the corner.

CONCLUSION

According to historical examples, confirmed by theoretical modeling, the storage capacity and the level of default penalty imposed on the shorts unable to deliver the commodity against futures contracts played the crucial role in the development of corners in the nineteenth century.

The expansion of storage capacity reduces the probability of manipulation *ex ante* but it could also be a useful tool in breaking up an actual corner as an *ex post* measure. The exchange authorities have the ability to declare more elevators regular thus making the corner harder to accomplish. That was the case during Lyon's attempted corner in 1872. At present the exchanges deter corners by allowing for delivery of a range of different qualities of a given commodity in a number of places.

The problem of a default penalty imposed on the shorts unable to deliver the physical commodity against the futures contracts is more delicate. That penalty was set up in order to compel the traders to respect their commitments and thus enhance the efficiency of futures markets. It seems paradoxical that this penalty makes the corners more profitable, thus encouraging manipulation and reducing the usefulness of the futures markets for hedgers and speculators - their legitimate users.

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END NOTES

1. Pirrong (1995b) records 124 cases of attempted manipulation on the CBOT between 1868 and 1924.
2. this unit of measure is equivalent to 8 gallons or roughly 25 kg.
3. "Regular" means officially recognized by the CBOT as an elevator where the deliveries against futures contracts can be made.
4. As was his aura. At that time the traders sang

I see Old Hutch start for the club
Goodbye my money, goodbye,
He’s given us a pretty rough rub,
Goodbye my money, goodby.

5. The superscripts *C* and *F* mean stand for Cash and Futures.

APPENDIX 1

In a game played with mixed strategies each player plays any given strategy with a certain probability. She maximizes her expected profit in equilibrium assuming that the probabilities chosen by her adversary are held constant. From the confrontation of these two maximization programs arises a Nash mixed strategy equilibrium.

Let us assume that the manipulator plays the strategy "to Manipulate" (M) with probability *p* and the strategy "Not to Manipulate" (NM) with probability *1-p* and that the hedger chooses the strategy "to Hedge" (H) with the probability *q* and the strategy "Not to Hedge" with probability *1-q*. We obtain the equilibrium probabilities by resolving the following programs:

$$\underset{p}{Max}\, E(\Pi_M)$$

and

$$\underset{q}{Max}\, E(\Pi_H)$$

The manipulator's expected profit equals:

$E(\Pi_M) = pq \times [\, (X - S)\, (D-P_0^F) + SP_1^L - S\, P_0^F\,] + p(1-q) \times [\, SP_1^L - S\, P_0^F]$
$+ (1-p)(1-q) \times 0 + (1-p)q \times 0.$

The first order condition to maximize her profit solves the following equation:

$$\frac{\delta E(\Pi_M)}{\delta p} = 0$$

Then the following condition must be satisfied:

$$\frac{\delta E(\Pi_M)}{\delta p} = \left[SP_1^L - SP_0^F\right] + q \times \left[(X-S)(D-P_0^F\right] = 0$$

yielding:

$$q = \frac{S\left(P_0^T - P_1^L\right)}{\left(X-S\right)\left(D-P_0^T\right)}\,.$$

We can easily check that this term decreases with *D* and increases with *S*. Thus:

$$\frac{\delta q}{\delta D} < 0$$

and

$$\frac{\delta q}{\delta S} > 0$$

In the hedger's case, his expected profit is expressed the following equation:

$$\begin{aligned} E(\Pi_H) = {} & p(1\text{-}q) \times [\, QP_0^F - a\, Q^2\sigma^2_p] + (1\text{-}p)(1\text{-}q) \times [Q\, P_0^F \text{-}a\, Q^2\sigma^2_p\,] \\ & + pq \times [(1\text{-}\, S/X)(QP_1^L\text{-}QD)+Q\, P_0^F\text{-}\, a\, (S/X\text{-}\, (S/X)^2)\, (QP_1^L\, \text{-}QD)^2] \; + (1\text{-}p)q \times Q\, P_0^F \\ & = Q\, P_0^F\text{-}\, a\, Q^2\sigma^2_p + q \times [\, a\, Q^2\sigma^2_p\,] + \; pq \times [\, (1\text{-}S/X)\, (QP_1^L\, \text{-}QD) \\ & - a\, (\, S/X\, \text{-}(\, S/X\,)^2)\, (QP_1^L\text{-}QD)^2]. \end{aligned}$$

The solution of the next equation satisfies the first order condition to maximize hedger's profit:

$$\frac{\delta E(\Pi_H)}{\delta q} = aQ^2\sigma_p^2 + p \times \left[\left(1 - \frac{S}{X}\right)\left(QP_1^L - QD\right) - a\left(\frac{S}{X} - \left(\frac{S}{X}\right)^2\right)\left(QP_1^L - QD\right)^2 \right] = 0$$

which yields:

$$p = \frac{aQ^2 o_p^2}{\left(1 - \frac{S}{X}\right)\left(QD - QP_1^L\right) + a\left(\frac{S}{X} - \left(\frac{S}{X}\right)^2\right)\left(QP_1^L - QD\right)^2}$$

It is straightforward to show that:

$$\frac{\delta p}{\delta a} > 0$$

$$\frac{\delta p}{\delta o_p^2} > 0$$

The probability of manipulation also increases with the amount of the penalty fee:

$$\frac{\delta p}{\delta D}=\frac{\left(a\sigma_{p}^{2}\right)\times\left[\left(1-\frac{S}{X}\right)Q+a\left(\frac{S}{X}-\left(\frac{S}{X}\right)^{2}\right)\left(-2Q^{2}P_{1}^{L}+2Q^{2}D\right)\right]}{\left[\left(1-\frac{S}{X}\right)\left(QD-QP_{1}^{L}\right)+a\left(\frac{S}{X}-\left(\frac{S}{X}\right)^{2}\right)\left(QP_{1}^{L}-QD\right)^{2}\right]^{2}}$$

Given that $D > P_1^L$ the term stated above is positive, thus:

$$\frac{\delta p}{\delta D}>0\,.$$

SIMPLIFYING THE TAX CODE IN NEW YORK STATE: THE CASE FOR ENVIRONMENTAL TAXATION AND REVENUE SUBSTITUTION

Thomas R. Sadler*

ABSTRACT

In a policy of revenue substitution, the State of New York could increase tax system efficiency while improving environmental quality. Revenue from a state environmental tax on chemical emissions could be used to eliminate pre-existing taxes on business activity. This paper simulates policy implementation and concludes that, in addition to simplifying the state tax code, the revenue-neutral regulation could improve environmental quality, provide a market-based incentive for pollution abatement and maintain the size of the public sector.

I. INTRODUCTION

For state governments, balancing the budget and maintaining a tax code conducive for economic growth are fundamental challenges. One way for the governing authority to reduce reliance on distorting taxes is through ecological tax reform (ETR), an important new development in public finance and environmental economics. Conceptually, ETR means the public sector uses revenue from environmental taxation to finance lower rates on pre-existing taxes that distort economic decision-making. The idea of ETR is to shift some tax burden away from production, labor and income, all economic "goods," toward pollution, an economic "bad" (Bosquet, 2000). In the process, the public sector may simplify the tax code. For the purpose of political feasibility, the key for ETR is revenue neutrality (Pearce, 1991). Even though environmental taxation constitutes new regulation, the size of the public sector remains the same.

Many articles point to the benefits of ETR. Von Weizsacker and Jesinghaus (1992) argue that ETR could enhance environmental quality and increase tax-system efficiency. Hamond et al. (1997) conclude that, while giving polluters a long-term incentive for pollution abatement, ETR could improve many economic problems simultaneously by increasing the incentive for work, savings and investment. Parry and Bento (2000) find the presence of tax-favored consumption can reduce the efficiency costs of new environmental taxes. In an empirical survey of research on ETR, Bosquet (2000) concludes that, in the short term, ETR has the potential of increasing employment and significantly reducing pollution. Even though the potential of ETR creating a double dividend—a cleaner environment and employment gains—is still open to debate, the empirical evidence has found examples of this result (Sadler, 2001; Bosello et al., 2001).

Using a method similar to the frameworks of these other studies, this paper contributes to the literature by modeling ETR and simulating policy implementation in New York State. While many papers have simulated policy implementation at the national level in the United States and abroad, no research

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has simulated ETR at the state level. Regardless of federal regulation, many reasons exist for implementation at the state level. Specifically, the policy could serve state environmental and fiscal goals. At the state level, regulators could identify polluters and implement effective policy. In addition, state regulation could provide policy makers with experience and familiarity that could be used at the national level. In other words, implementation of ETR at the state level could build momentum for national policy.

This paper estimates the extent to which ETR might reduce New York State's reliance on taxes on business activity. New York is the focus of the paper because, on a per-capita basis, the burden of state taxes exceeds that of every state but Alaska. The choice of chemical emissions as the target for environmental taxation results from an Environmental Protection Agency (EPA) requirement that firms report annual emissions.

Of particular policy interest in the paper is the ability of the public sector to tax a wide environmental base and limit the efficiency cost of the new tax policy. Using plausible parameter values, the paper finds that, in a revenue-neutral framework, the public sector in New York could reduce reliance on business taxes while providing a permanent incentive for the abatement of chemical emissions.

To develop this argument, this paper is organized as follows. Section 2 discusses the New York State tax system. Section 3 develops a first-best model of environmental taxation, including the formulation of environmental tax rates. Section 4 discusses chemical damage scores of the EPA. Section 5 develops a second-best policy framework. Section 6 simulates policy implementation. Section 7 concludes.

II. NEW YORK STATE TAX RECEIPTS

Table 1 lists New York State tax receipts from 1990 through 1999. As Table 1 makes clear, the public sector in New York State relies on personal income tax revenue for over 50 percent of its budget, although business and sales taxes make significant contributions. Under the category of corporation and business taxes, New York State taxes transportation, power, water, utilities, telecommunications and other activities.

Table 1—New York State Tax Receipts, 1990-1999

Year	Total State Collections	Personal Income	Corporation and Business	Sales, Excise and User	Property	Others
1999	37,165,396,955	20,662,375,214	5,820,785,763	9,224,443,948	1,412,773,448	45,018,583
1998	33,927,730,472	17,758,697,181	5,957,475,493	8,879,450,323	1,284,470,485	47,636,990
1997	32,076,909,740	16,370,887,332	5,920,605,026	8,609,791,751	1,126165,580	49,460,050
1996	32,178,839,324	16,998,212,766	5,709,784,799	8,330,926,856	1,086,847,097	53,067,806
1995	32,704,550,205	17,589,489,166	5,689,177,572	8,310,519,743	1,050,356,853	60,006,780
1994	31,254,356,521	16,033,514,352	6,229,073,291	7,862,010,220	1,054,582,023	75,166,635
1993	29,826,321,068	15,318,849,593	5,707,269,896	7,653,003,325	1,019,403,278	127,794,976
1992	28,594,999,541	14,913,380,341	5,190,949,381	7,374,501,861	1,030,726,798	85,441,759
1991	26,887,360,839	14,527,036,203	4,075,702,297	7,096,991,545	1,119,385,965	88,244,829
1990	26,930,157,402	15,240,467,249	3,378,609,123	7,125,785,027	1,097,369,979	87,926,024

Source: New York State Department of Taxation and Finance

III. FIRST BEST MODEL OF ENVIRONMENTAL TAXATION

Chemical manufacturers emit pollutants at different stages of the production process, including waste disposal. Chemical emissions, which may be hazardous, pose risk to human health and environmental quality. The risk stems from the properties of individual chemical releases: persistence, bioaccumulation and toxicity. According to the U.S. EPA (1998), highly persistent chemicals do not easily break down in the environment; bioaccumulative chemicals cannot be readily metabolized and can accumulate in ecological or human food chains via consumption or intake; and toxic chemicals pose risks to human health and the environment in many ways, depending on pollution concentration and chemical synergy. For example, when concentrated in an enclosed lake, the release of lead may poison an entire fish population.

Because of the ubiquity and uncertain impacts of chemical emissions, public policy makers face a difficult task in regulating these pollutants. But a variety of policy instruments are available. The EPA relies on command and control (CAC) regulation for chemical waste streams in the water, air and earth, which means mandating emission levels and abatement technology and restricting the use of certain chemicals (McKenzie, 1994). The Toxic Substances Control Act, Resource Conversation and Recovery Act, the Clean Air Act, and the Clean Water Act regulate chemical emissions (Sadler, 2000).

The steep cost of CAC regulation is creating momentum for a shift to a more decentralized policy regime. One example is the Toxics Release Inventory (TRI), an environmental databank, which is part of the 1986 Emergency Planning and Community Right-to-Know Act (EPCRA). The EPCRA mandates that a manufacturer with 10 or more employees in SIC codes 20-39 (with certain threshold requirements) must disclose the quantity of chemical emissions. Data from the annual reports to the EPA are tabulated in the TRI and published on the EPA website. Because interested parties may track chemical releases in their area and pressure companies to reduce pollution, the TRI represents a form of incentive policy (Konar and Cohen, 1997).

In addition, the United States taxes certain chemical inputs to production. These taxes target industries thought responsible for pollution and contamination. The revenue finances trust funds in the Superfund program to clean up the sites. However, the taxes do not discourage the economic activity that pollutes the environment (Fullerton, 1996).

As a result of the high cost of CAC regulation and the ineffectiveness of current environmental taxes on chemical inputs, the following model and policy simulation point to a more cost-effective and focused form of incentive policy. Using the TRI as the tax base for a system of environmental taxation would minimize administrative cost, because firms are already required to report to the TRI.

State government may use environmental tax revenue to finance lower rates on pre-existing taxes or eliminate certain taxes altogether. From the public perspective, the challenge is to formulate environmental tax rates on a per-unit basis that reflect the economic value of marginal pollution damage. The goal is to implement an environmental tax system that provides a long-term incentive for emission abatement.

The environmental tax system in this paper targets all on- and off-site emissions of companies in New York covered by the EPCRA. For target firms, the production of output (Y) leads to chemical emissions (e_1,..., e_n). These chemical releases lead to different levels of marginal damage, depending on the rate and quantity of emissions, meteorological conditions, chemical synergy, proximity to humans and other factors. We assume that chemical emissions are the only source of environmental damage not already internalized by public policy.

Emissions in the absence of regulation (e_a) are a function of output, $e_a = \theta Y$. Total emissions (E) equal the sum of individual releases (e_a^i): $E = \Sigma e_a^i$. Production cost of chemical polluters is a function of output: $C_1(Y)$. In response to an environmental tax, a firm reduces emissions (e_t^i) below its pre-regulation level, $e_t^i < e_a^i$. The cost of pollution abatement (C_2) increases with the level of emission reduction and output: $C_2 = C_2(e_a^i - e_t^i,\ Y) = C_2(\theta Y - e_t^i,\ Y)$. Marginal environmental damage (MED) from chemical emissions $D(e_t^i)$ is an increasing function of e_t^i. MED may increase at different rates.

State regulators may increase efficiency by estimating the economic value of marginal damage and by levying an environmental tax. Environmental regulators must focus tax rate design on the difference between marginal private cost (MPC) and marginal social cost (MSC), which is MED. A first-best tax internalizes MED in price, so polluters consider the environment as a priced input. Efficiency considerations require that MPC equal MSC, and that MED equal marginal control cost. In the absence of regulation or the presence of inefficient CAC policy, these equations do not hold.

Equations (1) - (15), adapted from Lesser et al. (1997) and Sadler (2000), show how regulators may set environmental taxes according to MED. Total private cost (TPC) associated with production equals the sum of production cost and the cost of abatement:

$$TPC = C_1(Y) + C_2[\theta Y - \Sigma e_t^i,\ Y], \tag{1}$$

where i = 1,..., n. Marginal private cost equals the marginal cost of increasing production plus the marginal cost of controlling additional emissions:

$$MPC = \partial C_1/\partial Y + \theta C_{21} + C_{22}. \tag{2}$$

Total social cost includes C_1, C_2 and the damage from chemical emissions:

$$TSC = C_1(Y) + C_2[\theta Y - \Sigma e_t^i,\ Y] + \Sigma D(e_t^i). \tag{3}$$

Marginal social cost equals MPC plus marginal damage:

$$MSC = \partial C_1/\partial Y + \theta C_{21} + C_{22} + \Sigma D_i'(de_t^i/dY). \tag{4}$$

To account for the marginal damage of chemical releases, regulators must implement environmental taxes. The per-unit tax on chemical emissions adjusts TPC:

$$TPC = C_1(Y) + C_2[\theta Y - \Sigma e_t^i,\ Y] + t_e^i e_t^i. \tag{5}$$

As a result, MPC becomes:

$$MPC = \partial C_1/\partial Y + \theta C_{21} + C_{22} + \Sigma t_e^i(de_t^i/dY) \tag{6}$$

First-best taxes are set according to MED, the difference between the MSC of equation (4) and the MPC of equation (6):

$$MSC - MPC = \Sigma D_i'(de_t^i/dY) - \Sigma t_e^i(de_t^i/dY) = (\Sigma D_i' - \Sigma t_e^i)(de_t^i/dY). \tag{7}$$

As equation (7) makes clear, the regulatory challenge is to adjust MPC by an environmental tax. Equation (7) and MED will equal zero if $t_e^i = t_e^{i'} \leq t^*$, where t^* is a first-best environmental tax that equals MED. Marginal external damage will be positive or negative as $t_e^{i'}$ is less than or greater than t^*, respectively.

The policy challenge is to estimate the economic value of MED. But instead of trying to implement an optimal environmental tax with imperfect information, a more realistic policy is to calculate the tax on one pollutant relative to others by comparing the relative damage of each. An EPA index of chemical damage values may facilitate this process.

IV. CHEMICAL DAMAGE SCORES

To prioritize the minimization of certain chemical releases, the EPA focuses on highly persistent, bioaccumulative, and toxic (PBT) chemicals, which pose long-term risk to humans and the environment. In particular, the EPA has established a chemical ranking of individual releases. The ranking methodology includes four criteria: PBT score, chemical prevalence in hazardous waste, evidence that chemicals exist in the environment at specific levels of concern, and the extent to which a chemical is targeted by the EPA (US EPA, 1998).

The four criteria provide a comprehensive procedure to calculate the relative risk of chemical releases. While the scientific methods of formulating the chemical rankings are beyond the scope of this paper, US EPA (1998) describes the methods in detail. To form a final list of target chemicals, the EPA aggregates the four criteria scores for individual chemical releases and arranges the scores in rank order from one to 100. Because the final scores take into account actual on- and off-site releases, the damage scores reflect potential risk to humans and the environment.

On a converted scale between zero and one, Table 2 lists the EPA damage scores per pound of emissions for the chemicals targeted in the policy simulation. One pound of mercury emissions, for example, is more hazardous with a damage score of 0.91 than one pound of chloroform emissions with a damage score of 0.674. For target pollutants in the policy simulation, the scores are used to measure marginal damage.

Table 2

EPA Chemical Damage Scores Per Pound of Emissions,

on a Scale from 0 to 1

Chemical	Score	Chemical	Score	Chemical	Score
1,1,1 Trichloroethane	0.674	Bromoxynil octanoate	0.25	Methyl parathion	0.34
1,1,1,2-Tetrachloroethane	0.424	Bromomethane	0.444	Naphthalene	0.701
1,1,2,2 Tetrachloroethane	0.521	Cadmium	0.924	Nickel	0.667
1,2-Dichlorobenzene	0.625	Carbofuran	0.382	Nitrobenzene	0.549
1,2 Dichloroethane	0.542	Chloroacetic Acid	0.278	Oxyfluorfen	0.111
1,2,4-Trichlorobenzene	0.667	Chloroform	0.674	Parathion	0.444
1,3-Dichlorobenzene	0.542	Chlorpyrifos Methyl	0.25	Pendimethalin	0.361
1,4-Dichlorobenzene	0.563	Chromium	0.778	Pentachlorophenol	0.653

2,4-D	0.444	C.I. Disperse yellow 3	0.167	Phenanthrene	0.681
2,4-Dinitrophenol	0.486	Cobalt	0.491	Phenol	0.674
2,4,5-Trichlorophenol	0.507	Copper	0.569	Phosgene	0.444
3,3'-Dichlorobenzidine	0.174	Decabromodiphenyl Oxide	0.292	Picric acid	0.236
3,3'-Dimethoxybenzidine	0.236	Diazinon	0.292	PCBs	0.868
3,3 Dimethoxybenzidine Dihydrochloride	0.167	Dicofol	0.361	Polycyclic Aromatic Cmpds.	0.917
4,4 Methylenebis (2-Chlorroaniline)	0.382	Dibenzofuran	0.438	Selenium	0.576
Acetaldehyde	0.257	Dibutyl Phthalate	0.694	Silver	0.796
Acrolein	0.299	Diphenylamine	0.444	Simazine	0.194
Acrylamide	0.34	Dimethoate	0.257	Tetrachloroethylene	0.618
Aldicarb	0.257	Ethylene Oxide	0.34	Tetrachlorvinphos	0.167
Allyl Alcohol	0.34	Fluometuron	0.167	Thiodicarb	0.292
Aluminum	0.389	Heptachlor	0.507	Thiram	0.278
Ametryn	0.194	Hexachlorobenzene	0.674	Triallate	0.292
Anthracene	0.674	Hexachlorocyclopentadiene	0.674	Trichloroethylene	0.618
Antimony	0.646	Hexachloroethane	0.493	Trifluralin	0.403
Arsenic	0.736	Lead	0.944	Triphenyltin chlor.	0.167
Atrazine	0.278	Linuron	0.167	Vanadium	0.38
Benomyl	0.382	Manganese	0.481	Zinc	0.856
Beryllium	0.583	Mercury	0.91		
Bromoacil	0.148	Methoxychlor	0.618		

Source: EPA

V. SECOND BEST ENVIRONMENTAL TAX POLICY

To adjust MPC and accurately tax chemical emissions, the regulator must identify the monetary value of marginal damage, D_i' in equation (7). This procedure requires two steps. First, the regulator must identify the marginal damage of an additional unit of chemical emissions, as compared to other target pollutants. Table 2 provides this information. The second step is to assign a tax rate that reflects the monetary value of pollution damage. The following environmental tax policy addresses these two issues by targeting a single base called a damage unit (DU). Because information on the monetary value of MED over a range of emissions is not available for chemical emissions, a second best policy framework is necessary.

One DU is defined to equal one emission pound of a hypothetical pollutant with a damage score of 100 in the EPA scoring list. One emission pound of the hypothetical pollutant equals one DU. With this hypothetical pollutant established as the numeraire, one emission pound of mercury equals 0.910 DU, one emission pound of silver equals 0.796 DU, and so on, according to the quantity of DU in Table 2.

The policy simulation below levies a single tax rate (t_{DU}) on one DU, and a different tax rate is then computed for each pollutant. For target chemicals, the resulting calculation is a tax rate per pound of emissions:

$$(t_{DU})(\text{DU/Emission Pound}) = \text{Tax Rate/Pound of Emission} \quad (8)$$

For example, if t_{DU} = \$2.00, a polluter would have to pay, according to the damage values in Table 2, \$1.89 for one emission pound of lead, \$1.85 for one emission pound of cadmium and so on.

To generate revenue, the tax rate per emission pound is multiplied by the quantity of annual on- and off-site emissions from the TRI:

$$\text{Tax Revenue} = (\text{Tax Rate/Pound of Emissions})(\text{Emissions}). \quad (9)$$

With the application of DU for target pollutants, TPC and TSC become:

$$TPC = C_1(Y) + C_2[\theta Y - t_{DU}\Sigma e_t^i DU_i,\ Y] + t_{DU}\Sigma e_t^i DU_i, \text{ and} \quad (10)$$

$$TSC = C_1(Y) + C_2[\theta Y - t_{DU}\ \Sigma e_t^i DU_i,\ Y] + \Sigma D_i e_t^i, \quad (11)$$

where $i = 1,..., n$. External cost, the difference between (11) and (10) is:

$$TSC - TPC = \Sigma D_i e_t^i - t_{DU}\Sigma e_t^i DU_i, \quad (12)$$

which will be less than, equal to, or greater than zero as t_{DU} is greater than, equal to, or less than some $t_{DU}' < t^*$, where t^* is a first-best tax.

Environmental taxation is formulated on the basis of MPC and MSC:

$$MPC = \partial C_1/\partial Y + \delta C_{21} + C_{22} + t_{DU}\Sigma DU_i(de_t^i/dY), \text{ and} \quad (13)$$

$$MSC = \partial C_1/\partial Y + \delta C_{21} + C_{22} + \Sigma D_i'(de_t^i/dY). \quad (14)$$

The difference between (14) and (13), marginal environmental damage, is

$$MSC - MPC = \Sigma D_i'(de_t^i/dY) - t_{DU}\Sigma DU_i(de_t^i/dY) = (\Sigma D_i' - t_{DU}\Sigma DU_i)de_t^i/dY. \quad (15)$$

In (15), the extent to which the EPA damage scores (DU_i) reflect actual marginal damage (D_i') determines how well the system approximates the first-best policy.

VII. POLICY SIMULATION

For policy simulation, 1999 TRI emission data were gathered for eighty-five chemicals in New York for SIC codes 20-39. The chemicals and total emissions are listed in Table 3. The key in the policy simulation is setting the tax rate on one DU. The Oak Ridge National Laboratory and Resources for the Future (1994) report aids this formulation process. Research from ORNL and RFF (1994) indicates that the marginal damage from one pound of lead emissions is $32.13. Lead was the only chemical emission included in the ORNL and RFF (1994) study. If the monetary value of damage for one pound of lead emissions, with a DU value of 0.994, is $32.13, the tax rate on a hypothetical chemical with a DU of one is $34.04. The policy simulation therefore assigned a tax rate of $34.04 per DU.

Table 3
Results of Policy Simulation: Tax Rates and Revenue

Chemical	Total pounds of emissions	Tax rate per emission pound	Revenue
1,1,1 Trichloroethane	4063	22.9430	93,217
1,1,1,2-Tetrachloroethane	0	14.4330	0
1,1,2,2 Tetrachloroethane	0	17.7348	0
1,2-Dichlorobenzene	0	21.2750	0
1,2 Dichloroethane	73,225	18.4497	1,350,978
1,2,4-Trichlorobenzene	0	22.7047	0
1,3-Dichlorobenzene	0	18.4497	0
1,4-Dichlorobenzene	0	19.1645	0
2,4-D	0	15.1138	0
2,4-Dinitrophenol	0	16.5434	0
2,4,5-Trichlorophenol	0	17.2583	0

3,3'-Dichlorobenzidine	0	5.9230	0
3,3'-Dimethoxybenzidine	0	8.0334	0
3,3 Dimethoxybenzidine Dihydrochloride	0	5.6847	0
4,4 Methylenebis (2- Chlorroaniline)	5	13.0033	65
Acetaldehyde	53,835	8.7483	470,964
Acrolein	0	10.1780	0
Acrylamide	3	11.5736	35
Aldicarb	0	8.7483	0
Allyl Alcohol	0	11.5736	0
Aluminum	142,994	13.2416	1,893,464
Ametryn	0	6.6038	0
Anthracene	755	22.9430	17,322
Antimony	17,914	21.9898	393,926
Arsenic	24	25.0534	601
Atrazine	0	9.4631	0
Benomyl	0	13.0033	0
Beryllium	0	19.8453	0
Bromoacil	0	5.0379	0
Bromoxynil octanoate	0	8.5100	0
Bromomethane	42,682	15.1138	645,086
Cadmium	6572	31.4530	206,709
Carbofuran	252	13.0033	3277
Chloroacetic Acid	1541	9.4631	14,583
Chloroform	1430	22.9430	32,808
Chlorpyrifos Methyl	0	8.5100	0
Chromium	591,935	26.4831	15,676,286
C.I. Disperse yellow 3	0	5.6847	0
Cobalt	3479	16.7136	58,147
Copper	199,987	19.3688	3,873,500
Decabromodiphenyl Oxide	17,507	9.9397	174,014
Diazinon	0	9.9397	0
Dicofol	0	12.2884	0
Dibenzofuran	0	14.9095	0
Dibutyl Phthalate	1377	23.6238	32,530
Diphenylamine	528	15.1138	7980
Dimethoate	0	8.7483	0
Ethylene Oxide	7	11.5736	81
Fluometuron	0	5.6847	0
Heptachlor	0	17.2583	0
Hexachlorobenzene	0	22.9430	0
Hexachlorocyclopentadiene	1118	22.9430	25,650
Hexachloroethane	0	16.7817	0
Lead	68,893	32.1338	2,213,791
Linuron	0	5.6847	0
Manganese	41,386	16.3732	677,623
Mercury	67	30.9764	2075
Methoxychlor	0	21.0367	0
Methyl parathion	0	11.5736	0
Naphthalene	10,283	23.8620	245,373
Nickel	533,012	22.7047	12,101,867
Nitrobenzene	0	18.6880	0
Oxyfluorfen	0	3.7784	0
Parathion	0	15.1138	0
Pendimethalin	0	12.2884	0
Pentachlorophenol	0	22.2281	0

Phenanthrene	0	23.1812	0
Phenol	89,026	22.9430	2,042,520
Phosgene	76	15.1138	1149
Picric acid	0	8.0334	0
Polychlorinated Biphenyls	11401	29.5467	336,862
Polycyclic Aromatic Compounds	42,063	31.2147	1,312,983
Selenium	47	19.6070	922
Silver	1752	27.0958	47,472
Simazine	0	6.6038	0
Tetrachloroethylene	37,933	21.0367	797,986
Tetrachlorvinphos	0	5.6847	0
Thiodicarb	0	9.9397	0
Thiram	0	9.4631	0
Triallate	0	9.9397	0
Trichloroethylene	376,319	21.0367	7,916,517
Trifluralin	0	13.7181	0
Triphenyltin chloride	0	5.6847	0
Vanadium	0	12.9352	0
Zinc	27,484	29.1382	800,835
Total	2,400,975		53,469,197

Using equation (8), a tax rate per emission pound was calculated for each target pollutant. To calculate total revenue, equation (9) was used. Table 3 includes these calculations. The total revenue generated on 2,400,975 emission pounds in New York State would have equaled $53,469,197.

Because of information limitations, the simulation included eighty-five chemicals. However, as the EPA continues to expand the mechanism that estimates damage scores, the statewide environmental tax policy could eventually target up to 3000 chemicals. This level of inclusion could potentially increase the amount of revenue generated by a factor of thirty, raising over a billion dollars. Governing authority could then use the revenue to simplify the tax code, finance a lower tax rate on business income and eliminate many business taxes in New York State. While the environmental tax represents new regulation, the overall size of the state public sector would not change. Revenue substitution would encourage business activity while the market-based policy would enhance environmental quality by discouraging chemical releases.

VII. CONCLUSION

This paper finds that, by reducing or eliminating taxes on business activity, ecological tax reform could increase the efficiency of New York State's tax system and improve environmental quality. In a revenue-neutral policy framework, the key for policy implementation is formulating environmental tax rates that reflect the marginal environmental damage of individual chemical releases. For chemical emissions, this policy requirement rests on the reliability of the EPA damage scores.

The level of policy success depends on the size of the environmental tax base, the extent to which the environmental tax encourages emission reduction and the degree to which the elimination of pre-existing taxes compensates companies for having to pay an environmental tax. To minimize efficiency losses, policy implementation would require an increase in the number of chemical emissions that fall under policy jurisdiction. Additional research will expand the size of the chemical set and investigate the environmental implications of a tax rate that will raise a higher level of revenue.

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LARGE RETAILERS, ECONOMIC DEVELOPMENT, AND THE LOCAL PROPERTY TAX BASE: EVIDENCE FROM WAL-MART IN NEW YORK STATE

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ABSTRACT

This study assesses the impact large, national retailers have on local governments. Specifically, the research investigates the impact of Wal-Mart on property values and property tax rates in a set of municipalities in New York State from 1990 to 1997. Results from regression analyses imply no change in total municipality property value. Property tax rates, however, are found to be higher: the combined city-village-town and special district tax rate increased a statistically significant 2.4 percent annually each year a Wal-Mart was present in a municipality. Disaggregation shows that special-district tax rates rose 2.6 percent annually and the city-village-town property tax rate rose similarly.

INTRODUCTION

The question of economic development is especially problematic in smaller communities. While some are doing quite well, often few options exist for small communities isolated from larger market centers as the traditional manufacturing base declines, removing a primary source of high-paying employment for local citizens. As a result, local governments have been forced to look elsewhere for economic stimulus. Meanwhile, large national retailers such as Wal-Mart have identified smaller, rural markets as a growth area. For these reasons, smaller communities have courted large retailers -- often offering large subsidies and tax expenditures[1] -- with the hope that the new retailers will provide jobs and stabilize the tax base and revenues, while stimulating the overall local economy (Mitchell, 2000; Hornbeck, 1994). Retailers and public officials insist that these expenditures are justified and this view is reinforced by advocates of the retailers such as the International Mass Retailers Association (1995, p. 57) which asserts "... a community, whether rural or urban, can benefit from the presence of mass retailers, and is likely to lag economically if they are not present."

But not all agree. Opponents concede that retailers such as Wal-Mart enlarge a community's trading area and bring greater product selection with lower prices, but contend that the new retailers only shift employment from smaller retailers, many of whom eventually close, to the new stores; that they decrease the aesthetic qualities of small-town life; and that they cause property values to fall and property tax rates to rise -- as local government spending increases and/or the property tax base falls. Mitchell (2000, p. 15) argues that promised gains in employment and tax base will invariably be off-set over the long term by job and tax losses at existing retailers, producing only marginal overall improvement or even a net decline in some cases. She comments that "even without additional subsidies, the public cost of

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development -- expanding roads and providing services such as water and sewers -- combined with declines in property values and sales taxes in existing retail centers may actually exceed the tax revenue generated by the new retailer." Adding fuel to the fire are statements such as this one by a lawyer for Wal-Mart in Upstate New York: "Do you try to pay taxes? Not if you don't have to." [2]

Such wide-spread, and in some cases bitter, disagreement has garnered much attention in the popular press (e.g. Alexander, 1993; Shiller, et al. 1992; Kaufman, 1999), but not the academic press. Research by Stone (1995) and Barnes, et al. (1996) appear to be the primary exceptions. The impact of Wal-Mart on employment and sales at the county level has received most of the attention, but other indicators of the value of these retailers, such as their impact on the tax base and revenues of local governments remain understudied. Winders (2000, p. 102) notes that "little discussion of the role of retail and service businesses, *per se*, has appeared in either academic or professional development literature. Yet many non-metropolitan communities are responding to opportunities and threats from this type of development." We address this gap in this paper. In particular, we examine the impact of one large retailer, Wal-Mart, on the tax base and tax rates of smaller communities in upstate New York. Our research questions emanate from one primary question: do large retailers deliver on the promise of revitalization that so many rural municipalities count on?

We begin with a brief discussion of the background of large retailers in smaller communities and the theoretical justification for viewing them as economic development tools. The potential impact of large retailers on local government finances is then discussed. This is followed by a presentation of the econometric model used to address the impact on property values and property tax rates. Results are then presented and discussed.

BACKGROUND

After years of expansion, the retail sector began a long period of consolidation in the mid 1980s, fueled by changes in demographics, technology, and consumer preferences (Standard & Poor's, 1999; Shiller, et al., 1992). The growth in the number of retail establishments slowed nationwide while, between 1982 and 1992, the number of retailers operating at two or more locations grew by 27 percent. As a consequence, employment in the retail sector shifted from smaller to larger retailers: the share of employment in firms with sales of less than $1 million decreased from 37 to 35 percent while the share of employment in firms with more than $100 million in sales increased from 31 to 43 percent. These changes occurred in urban as well as rural markets. Winders (2000), for example, finds that nearly half of all net job growth in nonmetropolitan Georgia was attributable to large non-manufacturing businesses. The consolidation was led by national chains such as Home Depot, Staples, and Wal-Mart, which opened thousands of new stores during this time.

The trend toward bigger, chain-operated retail establishments was more pronounced in states with relatively less robust economies. New York State, for instance, actually experienced a decline in the number of retail establishments between 1987 and 1997. Even more striking, though, were the changes taking place in smaller communities. With stores exceeding 100,000 square feet, a single, large retailer such as Wal-Mart may capture a significant share of retail sales. Schoharie County in New York State may represent an extreme. The 1992 Census reports that 149 establishments existed in the county, with total sales of $143 million. When a Wal-Mart opened a "supercenter" in the small village of Cobleskill, in central Schoharie County, in 1995, its estimated annual sales of $45 million represented 31 percent of *county* retail sales.[3] This share rises to over 50 percent when the subgroups "gasoline service stations" and "eating and drinking establishments" are excluded.

Large retailers brought with them a promise of improved economic conditions that seemed especially enticing to smaller communities with stagnant or declining economies and tight government budgets. It was hoped that the large retailer would expand the economy's market area by attracting shoppers from out of town. It would also keep local shoppers from going to larger cities for goods previously unavailable locally, essentially shifting the hierarchical position of smaller places within the classic central place system (Berry and Parr, 1988). As a result, employment and sales tax revenue would increase, the property tax base would stabilize or rise, and consumers would enjoy lower prices and greater selection. Existing local retailers of course opposed additional competition, and with good reason. By virtue of scale economies, large retailers enjoyed lower costs and therefore often replaced a significant portion of higher cost independent and regional chain retailers in smaller communities (Muller, 1995; Kaufman, 1999; Stone, 1995). When the new retailer built on the outskirts of town it drew traffic away from businesses located in the traditional downtown, or main street, area. Reduced foot traffic also led to decreased sales of retailers who might not have directly competed with Wal-Mart, furthering the decline in the traditional downtown.

The increase in market area by itself increases the local multiplier (Olfert and Stabler, 1999) and increases the sales tax revenue which is so important to local governments (Snodgrass and Otto, 1990). The latter can have far reaching implications for local governments: as market area expands, the municipality attracts shoppers from outside the taxing jurisdiction. Municipalities which control local sales tax rates then find that they can export some of their sales tax to non-residents,[4] lowering the cost of public goods to residents (Tannenwald, 1997; Morgan, et al., 1996; Sokolow, 1981). This may lead to overprovision of public goods, or a shifting of tax preferences from the property tax to the sales tax, creating its own distortions (Wildasin, 1986; Krmenec, 1991).

On the other hand, a large retailer also increases 'foreign' ownership, which translates into leakages that decrease the local multiplier (see Levy, 1990, and Shaffer, 1989, for discussion of rural economies). The leakages occur via two routes. First, locally-owned firms are more likely to buy inputs (such as supplies, and accounting, insurance, payroll, and banking services) locally. A decline in local ownership reduces those indirect contributions to local economies if the out-of-town owners buy those inputs elsewhere.[5] Second, profits of large retailers are removed from the local economy whereas profits from locally-owned businesses are more likely to stay within the region (Pred, 1976).[6] Even though the net effect was (and remains) uncertain, many (although certainly not all) local development officials pressed on, pledging support for large retailers. Large retailers became increasingly important in rural areas in the Northeastern United States. Wal-Mart, in particular, expanded aggressively in the northeast during the 1990s after years of expansion in the South and West left those areas saturated.

The impact of large retailers received considerable attention from the popular press and public officials (Hornbeck, 1994). The Committee on Small Business of the House of Representatives (1995), for example, held public hearings to consider the "impact of discount superstores on small business and local communities," with testimony arguing both for and against retailers such as Wal-Mart. In the academic arena, Stone (1995) documented the shifting market structure and the widening market area created by Wal-Mart in rural Iowa towns (using Pull Factors -- the ratio of local per capita retail sales to statewide per capita retail sales). He concluded that competitors of Wal-Mart suffered in terms of decreased sales. University of Missouri researchers (Franz and Robb, 1988, 1991) reported that large retailers had a positive economic impact -- in terms of increased sales and employment -- on the economies in rural counties in the Midwest. Yet Barnes, et al. (1996) found "that as Wal-Mart entered the Northeast market, the company's impact was diluted compared to that in the Midwest and South" in terms of sales and employment. The study presented below adds to the discussion by considering the impact in a new geographic area and along a new dimension: the effect of Wal-Mart on property values and tax rates at the municipal level. Although much discussion has occurred concerning the impact of Wal-Mart on tax bases, tax rates, and local government spending, no published research to date has directly examined the impact of Wal-Mart on these measures. Our first hypothesis is that the entry of a large retailer significantly alters the retail landscape, leading to a decline in municipality-wide property values, primarily as a result of lower commercial values as smaller retailers close. Commercial property represents a significant portion of the property tax base. The value of older commercial property is largely a reflection of sales; thus a sales decline will lower the market value of a commercial property. Its assessment for tax purposes, while it may lag changes in market value, ultimately is a function of the market and will also decline (Muller, 1980). As extant (small) businesses lose sales to the new (large) retailer their assessments decline. This paper tests whether the decline in property values attributable to the failure of smaller businesses outweighs the increase attributable to Wal-Mart itself.

Furthermore, we hypothesize that property tax rates will rise either (1) as the tax base declines (assuming municipal spending is not decreased), or (2) as municipal spending is increased to meet new demands associated with Wal-Mart. The property tax is the most frequently used local taxing option and provides the lion's share of local own-source revenues (Dearborn, 1993; Mields, 1993). For example, it is much greater in magnitude than fees and is under greater local control than the sales tax.[7] It is also the most adjustable of the main local revenue sources, moving up or down with spending needs. Consequently, property tax rates change often and are closely watched by residents and government officials. They are frequently viewed as a barometer of local government performance. To test our hypotheses, we will examine municipal-wide property values and effective property tax rates in non-metropolitan upstate New York municipalities, some of which saw a Wal-Mart open within their jurisdiction in the 1990s.

DATA AND ECONOMETRIC APPROACH

At the end of 1999, Wal-Mart had more than 50 stores in New York State. During the period 1990 - 1997, Wal-Mart opened 24 stores in relatively small municipalities, defined as municipalities with fewer than 35,000 people in counties with fewer than 80,000 people.[8] These 24 municipalities, along with 85 similar municipalities which did not have a Wal-Mart, comprise our panel data set totaling 872 observations. Limiting the dataset to smaller municipalities has several advantages. First, municipalities selected in this manner are more likely to be similar in economic and government fiscal characteristics. This will lead to a more homogeneous data set. Second, smaller, rural areas represent an important area for expansion by big-box retailers, especially Wal-Mart. Third, the smaller size allows for a greater opportunity to observe the impacts of a single large retailer. Fourth, with stagnant economies, smaller communities in New York State are likely to feel the impacts of major market restructuring the most. Some of the municipalities in our study are in counties defined by the U.S. Census as urban - i.e. part of a metropolitan statistical area (Cobleskill, in Schoharie County for example). Yet even these communities can be thought of as non-metropolitan.[9] Our definition of smaller community refers to the set of choices afforded retail consumers - as limited by travel time to larger urban centers.

Data on property value and property tax revenue by municipality for each year from 1990 to 1997 (the latest year for which data were available) were obtained from the New York State Office of the State Comptroller. The Comptroller's data on assessed property value from the municipalities were adjusted by a sales-to-assessment ratio to get full property value.[10] Store locations and opening dates were obtained directly from Wal-Mart and local assessors provided information about which municipalities had taxing authority for property tax purposes. Summary data are presented in table 1. Non-Wal-Mart municipalities have a slightly higher average population than Wal-Mart municipalities while Wal-Mart municipalities have a somewhat higher average property value. Both Wal-Mart and non-Wal-Mart groups had wide variation in municipality population and property values. Five municipalities had a Wal-Mart for exactly six years during the sample period; six had a Wal-Mart for exactly five years; three for four years; and ten for three years. All municipalities had a Wal-Mart for at least three years.

Two sets of regressions were performed: the first used property values as the dependent variable and the second used property tax rates. The econometric models take advantage of the panel data at our disposal to control for jurisdiction-specific effects when estimating the impact of Wal-Mart (Balestra, 1992 and Hsiao, 1986; see Papke, 1994, for a similar application to urban enterprise zones). Thus, the models allow the effects of the retailer to be correlated with unobservable factors that affect municipality property values. It also allows for the possibility that municipalities with rising property values were chosen as sites for stores by Wal-Mart over municipalities with a less favorable economic climate. This approach contrasts with previous studies of Wal-Mart (such as Franz and Robb, 1988, 1991) which did not make such allowances.

Table 1
Summary Statistics
1990

		Population	Property Full Value	Property Full Value per Capita
All Municipalities	ave =	9,771	193,447,873	20,230
	stdev =	6,022	143,496,957	7,553
n = 109	min =	2,913	44,449,095	7,676
	max =	33,724	936,000,000	45,365
Non-WM	ave =	10,017	186,404,491	19,194
Municipalities	stdev =	6,270	119,094,972	7,038
	min =	5,002	44,449,095	7,676
n = 85	max =	33,724	622,000,000	45,365
WM	ave =	9,023	214,838,885	23,375
Municipalities	stdev =	5,232	201,778,020	8,306
	min =	2,913	62,053,730	9,615
n = 24	max =	23,016	936,000,000	41,361

# of Municipalities with a Wal-Mart open x years during the sample period:	1 year	2 years	3 years	4 years	5 years	6 years
	0	0	10	3	6	5

The basic model is given by equation (1). In it, property value is a function of the jurisdiction-specific α_i, a time trend, t, and a dummy variable, WM_{it}, that equals 1 if a Wal-Mart is present in municipality i in year t, 0 otherwise:

$$\text{(1)} \qquad \log P_{it} = \alpha_i + \beta t + \delta WM_{it} + u_{it}$$

where P_{it} represents the property value in municipality i in year t.

The α_i, which reflect jurisdictional fixed effects, control for unobservables that are time-invariant over the sample period.[11] The time trend controls for macro factors that affect all jurisdictions. δ measures the impact of Wal-Mart on the property values. If δ is greater than 0, the presence of Wal-Mart increases property values in that municipality by $100*(e^{\delta} - 1)$ percent (Halvorsen and Palmquist, 1980). A consistent estimate of the WM effect will be obtained with OLS without including other potential explanatory variables - provided they are not systematically related to placement of Wal-Mart stores, after controlling for these fixed effects and aggregate-economy effects (e.g., Papke, 1994, p. 43). Local characteristics are omitted from the regression since they are either subsumed into the time-invariant fixed effects or are assumed to be orthogonal to placement of Wal-Mart in the municipality. This is acceptable since the regression is not seeking to explain property values, only the influence of Wal-Mart.

Due to the nature of the data, the unobservables in equation (1) are likely to be correlated over time -- that is, the OLS requirement of independent error terms is likely to be violated (which will lead to inefficient estimators) -- and tests indicate that this is in fact the case with the data used here. To correct for this we estimate the magnitude of the correlation and perform the appropriate differencing to equation (1) for successive time periods. The result is expressed in equation (2),

(2) $$P^* = \alpha^*_i + \beta t^*_t + \delta WM^*_{it} + u^*_{it}$$

where the * indicates that differencing was performed on that variable (see Maddala, 1992, for handling of dummy variables in this context). With these transformations, one can estimate equation (2) using OLS. The first indication is that Wal-Mart has no effect on property values (see the column labeled 'Model 1' in Table 2). The value of the coefficient (δ) is 0.0046 and the t-statistic is less than 1. Equation (2), however, assumes an initial effect of the Wal-Mart that remains constant over time. That is, it imposes the restriction that the Wal-Mart has the same effect in each year after opening (a permanent shift). One might expect the impact of Wal-Mart to take time. As consumers become better informed, pre-Wal-Mart retailers close, property values and municipal spending adjust. To allow for changes over time we replace the dummy variable WM^*_{it} with WMT^*_{it} to measure the effect for each year the Wal-Mart was open:

(3) $$P^* = \alpha^*_i + \beta t^*_t + \varphi WMT^*_{it} + u^*_{it}$$

where the * once again indicate that the data have gone through general differencing. WMT_{it} counts the number of years Wal-Mart had been open in the municipality at time t. Thus, WMT_{it} equals 1 the first year a Wal-Mart is present in municipality i, 2 the second year a Wal-Mart is present in municipality i, and so on (and zero otherwise). The coefficient φ measures the impact of Wal-Mart on the property values each year Wal-Mart is in the municipality. Thus, the total effect of Wal-Mart on a municipality is φ in year one, φ*2 in year two, and so on. OLS was run using this specification and again the results were not statistically significant (see Model 2 of Table 2).

The implication to this point is that Wal-Mart does not affect property values in the municipalities in which it operates. The models used so far, though, may obscure trends that emerge only slowly. Equation (3) limits the impact of Wal-Mart to a constant increase from year to year (φ). To allow for changes in the magnitude of the impact over time, the model is made even more flexible. A series of dummy variables for each year the Wal-Mart was open in a municipality replaces WMT^*_{it} in equation 3 to get:

(4) $$\log P_{it} = \alpha_i + \beta t + \Sigma\delta_y WM_{yit} + u_{it} \qquad \text{for } y = 1 \text{ to } T$$

Table 2

Effects of Wal-Mart on Property Values
Small, Rural Communities in New York State
1990-1997

	Property Values		
	Model 1	Model 2	Model 3
WM	0.0046 (0.009)		
WMT		0.0034 (0.006)	
WM1			0.0019 (0.009)
WM2			0.0083 (0.012)
WM3			0.0161 (0.013)
WM4			0.0092 (0.015)
WM5			0.0089 (0.018)
WM6			-0.0036 (0.023)
R^2	0.99	0.99	0.99
Obs.	763	763	763

Standard errors are in parentheses.
Note: This table does not contain the values for the 109 α_i and β in equation 3 as they are not meaningful to the primary discussion and would be too numerous to be presented compactly.

where T is the length of the maximum number of years any municipality hosted a Wal-Mart (six years). WM_{yit} is set to 1 if Wal-Mart was present for y years in jurisdiction i at time t, 0 otherwise. The δ_y in this formulation measures the impact of Wal-Mart through year y. That is, δ_y is the cumulative effect through year y of the presence of Wal-Mart on the property tax rate in municipality i. The net effect of year y alone is δ_y minus δ_{y-1}. After the appropriate adjustments to correct for autocorrelation, one can estimate equation (4) using OLS. The results, presented in the column labeled 'Model 3' in table 2, again suggest that a municipality's aggregate property value is not affected by the presence of a Wal-Mart within the municipality. None of the coefficients are economically large or statistically significant.

The lack of statistical significance in the early years of a Wal-Mart's presence in a municipality is surprising given the addition of Wal-Mart itself to the tax rolls. Furthermore, it does not appear that the presence of Wal-Mart subsequently leads to a significant decline in municipal-wide property values when smaller businesses that compete with Wal-Mart fail. What is clear is that claims that the presence of a Wal-Mart in a municipality increases property values and the tax base appear unfounded. This is noteworthy in that it contradicts the perception of local officials and claims by large retailers and their proponents. Of course, it also implies that the worst fears of opponents are not realized.

To assess the critics' argument (and our second hypothesis) that Wal-Mart leads to increased local spending and a long-term increase in the tax burden, we perform a second set of regressions using various effective property tax rates as the dependent variable. The effective property tax rate is defined as property tax revenues divided by full property value in each municipality. Local governments first determine spending needs and then set the property tax rate accordingly (dividing the spending needs to be financed by the local property tax by the property tax base). Thus, a change in local spending to be financed by property taxes or a shift away from the property tax to reliance on the sales tax will lead to a corresponding change in the property tax rate.

The first regression in this set uses the combined city-town-village and special district property tax rate as the dependent variable. These taxes are decided locally, based on spending needs within the municipality. The results are shown in table 3. The initial model ('Model 1', based on equation 2) indicates that Wal-Mart has a statistically insignificant effect on property tax rates (although the coefficient suggests a 2.3 percent increase). Model 2 (equation 3), however, shows that tax rates climb with the number of years a Wal-Mart has been open in a municipality. The coefficient on the WMT variable in this model is statistically significant at the 1 percent level. The combined local property tax rate increases almost 2.4 percent each year a Wal-Mart is open in that municipality. That is, municipalities with a Wal-Mart experienced an increase in the combined locally-controlled property tax rate that was almost 2.4 percent per year greater than in similar municipalities without a Wal-Mart. After six years the combined tax rate is estimated to be 14.2 percent higher.

The results of applying equation 4, which allows the effect of Wal-Mart to vary from year to year, are shown in table 3 as Model 3. Here the results are somewhat less clear. The coefficients are greater than zero for years one through three, but are statistically insignificant while the coefficients for years four through six are statistically significant (at the 5 percent level). But the implication is the same: after six years, a municipality with a Wal-Mart has a higher property tax rate (of just over 10 percent in this formulation). An F-test testing whether all δ_y jointly equal 0, indicated the marginal usefulness of the equation (F=1.22). This formulation of the model (equation 4) may be asking too much of the data, as the number of observations is quite small (with 26 Wal-Marts split over six years).

Table 3
Effects of Wal-Mart on Property Tax Rates for Small, Rural Communities in New York State
1990-1997

	Combined City/Village/Town and Special Districts			Special district only			City/village/town only		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
WM	0.0226 (0.0180)			0.0507*** (0.018)			-0.0066 (0.018)		
WMT		0.0234*** (0.009)			0.0256** (0.013)			0.0264** (0.013)	
WM1			0.0150 (0.019)			0.0532*** (0.018)			-0.0189 (0.022)
WM2			0.0360 (0.023)			0.0436* (0.023)			0.0186 (0.028)
WM3			0.0385 (0.025)			0.0453* (0.026)			0.0287 (0.030)
WM4			0.0059** (0.029)			0.0494 (0.031)			0.0579 (0.036)
WM5			0.0742** (0.033)			0.0657* (0.035)			0.0835** (0.041)
WM6			0.1010** (0.045)			0.112*** (0.047)			0.0617 (0.055)
R^2	0.99 for all								
Obs.	763 for all								

* statistically significant at the 10% level.
** statistically significant at the 5% level.
*** statistically significant at the 1% level.

Standard errors are in parentheses. Note: This table does not contain the values for the 109 α_i and β in equation 3 as they are not meaningful to the primary discussion and would be too numerous to be presented compactly.

The results support the hypothesis that the existence of Wal-Mart leads to increased spending needs by local governments, which in turn leads to higher tax rates. It is possible that the increase in tax rates is reflective of the additional revenue needed to cover increased local spending on public services, such as highway, water, sewer, and fire. It is common knowledge that Wal-Mart prefers to build on the outskirts of town, sometimes arguing for extension of town or village boundaries so as to be included in those public service areas (as happened in the Village of Cobleskill -- where the village boundary was extended, a main highway route altered, and an intersection with a traffic light built). Much of the new local government spending may be for special districts (the water, sewer, and fire just noted). To address this possibility we disaggregate the taxes into a special district only tax rate and a city-village-town only tax rate. Special district tax rates rose a statistically significant 5.1 percent as indicated by model 1, suggesting that municipalities incur long-term costs associated with the opening of Wal-Mart (see middle set of columns in table 3). Models 2 and 3 indicate similarly robust results: a 2.6 percent annual rise in property tax rates (model 2) with year-six taxes more than 11 percent higher (although, again, the F-test on model 3 indicated weak usefulness of that formulation: F=1.21). The important implication is that public spending associated with the presence of a Wal-Mart causes the tax rate to increase. If a municipality has a Wal-Mart it can expect to experience higher special-district tax rates – presumably reflecting increased spending on those services.

Wal-Mart also affects city-village-town-only tax rates. This tax rate was statistically insignificant using model 1, but seemed to increase (by almost 2.7 percent) each year the Wal-Mart existed using model 2. The coefficient in model 2 was statistically significant at the 5 percent level. Model 3 offered no conclusive evidence of a trend. The conclusion one should draw is that the bulk of the effect of Wal-Mart is on special district taxes, not taxes for general town funds.

As noted earlier, we recognize that a change in property tax rates may result from tax exporting or shifting. But exporting or shifting does not appear to have played a factor in the results presented above: most of these municipalities were unable (or were unwilling) to substitute the sales tax for the property tax. Implementation of the sales tax in New York State is limited to county and city governments; so the ability to substitute this tax at the municipality level is severely limited (Office of the State Comptroller, 1998). Of those municipalities with autonomy over the sales tax only one increased it (Auburn, from 0 to 2 percent) during the time Wal-Mart was present, while one municipality (Amsterdam) actually decreased its local portion (from 1.5 to 0 percent) just prior to Wal-Mart opening. Four counties with a municipality hosting a Wal-Mart increased their county sales tax rate just prior to or after the Wal-Mart opening.

Increases in the locally-decided property tax rate may be off-set by decreases in the county-wide property tax rates, as more sales tax revenue is collected by the county. An increase in county sales tax revenue implies either (1) attracting new customers from outside the county, (2) retaining customers who previously left the county to shop elsewhere, or (3) both. Additional investigation revealed no evident link between placement of Wal-Mart and sales tax revenue at the county level for the years between 1992 and 1997. More sophisticated work - taking into account trade patterns with surrounding counties -- needs to be done to investigate this relationship more rigorously. If county sales tax revenue increases when Wal-Mart comes to the county, because, for example, shoppers stay within the county to shop (as is suggested by conclusions of Stone), then county-level and/or city and town property tax rates may decline as more sales tax revenue is collected and distributed to them. In New York State, the local portion of the sales tax usually is collected by the county and then is either retained by the county or distributed to cities and towns within the county (whether they have a Wal-Mart or not), based on a negotiated agreement among local officials. Either way the regression results presented in table 3 suggest that while municipalities without a Wal-Mart may benefit from the increased sales tax revenue they do not suffer from additional local government spending requirements. But this is really speculation. To confirm this one needs to compare Wal-Mart municipalities with municipalities within the same county, attempting to identify the extent of changes to local (town and special district) taxes in non-Wal-Mart municipalities.

CONCLUDING REMARKS

While big-box retailers in general, and Wal-Mart in particular, claim that their presence leads to improved local economies and local government finances, most often stated in terms of increased property values and decreased property tax rates, this was not in fact the case in small, non-metropolitan municipalities in New York State during the 1990s. As Wal-Mart and other "superstores" pursue a "saturation strategy," placing stores in municipalities so as to achieve contiguous market areas, local officials and citizens alike need to understand the effects of changing market places on local government finances. Given that the property tax has historically been, and remains, the major source of non-grant revenue for local governments (Dearborn, 1993; Mields, 1993), the results above should trouble local government officials -- and citizens. Property values are unchanged and tax rates are rising, thereby increasing the already tight fiscal position many smaller municipalities find themselves in.

Our first hypothesis that the entry of a large retailer leads to a decline in municipal-wide property values, primarily as a result of lower commercial values as smaller retailers close, was unsubstantiated. Our second hypothesis that property tax rates will rise in the presence of a Wal-Mart as a result of increased public spending was substantiated with statistically significant increases in the overall city-town-village-special district tax rate and its components. The results presented in this paper parallel those of Muller (1970, 1980) which appeared long before Wal-Mart burst onto the national spotlight. And they appear to support, at least in part, Mitchell's (2000) assertion that "even without additional subsidies, the public cost of development -- expanding roads and providing services such as water and sewer -- combined with declines in property values and sales taxes in existing retail centers may actually exceed the tax revenue generated by the new retailer."

Still, several qualifications must be noted. The research here has not accounted for the benefits of public spending. Higher tax rates are not, by themselves, necessarily bad - they finance increased public spending, which may be more highly valued by taxpayers than the taxes they pay. Nor has the suspected increased tax burden been weighed against the benefits (greater product selection, convenience, reduced costs, reduced travel time for goods previously purchased out of town) of a single large retailer. We admit property values and tax rates are not all-encompassing measures of the impact of Big-box retailers on local economies. With the appropriate data, many other economic costs and benefits might also be measured: retail bankruptcies, reduced demand for local services such as banking, increased demand for public goods such as roads and sewer, reduced retail prices, increased product selection, and so on. Of course, social and ecological implications exist and should also be considered in the bigger picture.

The results presented here represent an initial attempt to examine the impact of big-box retailers on local government finances. This is obviously an important issue and deserves much more research attention. It is hoped that this study contributes to that understanding and spurs additional inquiry.

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END NOTES

1. Examples in New York State include several millions of dollars in subsidies to Wal-Mart in Johnstown (one hour west of Albany) and the Village of Cobleskill, which extended its village boundary to accommodate a new Wal-Mart.
2. Tom Ulasewicz, Wal-Mart's attorney in Lake Placid, quoted in the Sunday *Times Union*, Albany, New York, March 5, 1995, p. A-3.
3. The $45 million figure is obtained using 150,000 square feet, the size of the Cobleskill store, times the nationwide average annual sales per square foot from Wal-Mart of $300 (Wal-Mart, 1997).
4. This assumes that the sales tax rate is set at the municipality level. Since the implementation of the local sales tax is restricted in New York State to county and city governments, many of the Wal-Mart municipalities do not have autonomy over and hence cannot export the sales tax, except to consumers from outside the county.
5. Wal-Mart has implicitly acknowledged this with their "We buy local" campaigns.
6. Nelson and Beyers (1998) apply an economic base model that decomposes sources of income accruing to a typical regional economy into local and non-local components. A wealth effect via changes in real property value may also influence local economic activity.
7. This is the case in New York State, which places several restrictions on imposition of the sales tax. See Office of the State Comptroller (1998).
8. Municipalities, communities, and market areas are not necessarily delineated along the same lines, but data availability leads to use of municipalities.
9. Schoharie County has 53 people per square mile compared to 556 for Albany County. Most of the counties with municipalities included in this study have fewer than 100 people per square mile.
10. Two notes are in order. First, big-box retailers build new structures on recently sold parcels and thus are more easily assessed than older established businesses (Popolizio, 1999). Second, Using full property value is intended to mitigate differences in assessment practices, as it is widely recognized that assessment practices are not standardized from jurisdiction to jurisdiction. Additional differences can be accounted for in the econometric model and so should not have an impact on the econometric results presented.
11. α_i also capture differences in the age and composition of the housing stock and municipality location (e.g. highway access). We expect the α_i to hold much of the 'explanatory' power of the regression, due to common structural characteristics of municipalities during the sample period.

OPERATING RETURN TRENDS

Richard Skolnik*

ABSTRACT

This study examines the operating returns, margins and turnovers of non-financial S&P 500 companies from 1982-1999. At the aggregate level, operating return remains relatively stable during the time period and exhibits no trend. However, asset turnover displays a steady decrease, which is offset by increasing profit margins. The cross-sectional analysis indicates that although margin and turnover both contribute to superior return, margin is more highly correlated to return. Consistent with economic theory for a competitive equilibrium environment, margin and turnover are negatively correlated with each other in both the cross-sectional and time-series analyses. Operating returns do not exhibit a trend but they vary cyclically with changes in GDP.

INTRODUCTION

Cash flows from financial investments ultimately are tied to the cash flows produced by the underlying assets. Returns that firms can generate from their assets drive the returns available to the providers of capital. As the Internet bubble of the late 1990s demonstrated, short-term financial returns are possible without cash flows on the underlying real assets, but these returns are not sustainable in the long run. Return on assets (ROA) consists of two components: profit margin, which is the mark-up of price above cost; and asset turnover, which is the sales revenue generated by a dollar of assets. The ability of financial assets to generate higher returns for investors depends upon the increased profitability of assets, which in turn, depends upon increases in either profit margin or asset turnover.

This paper examines operating returns and its components for non-financial S&P 500 companies from 1982-1999 to determine trends in profitability and implications for returns on investment. Two levels of analysis are performed. First, using firm-specific cross-sectional data, return, margin and turnover are analyzed. Second, annual averages for return, margin and turnover are calculated for the sample and the intertemporal results are studied. Equity investors received a historically high return during the period 1982-1999. This study tests whether operational profitability increased during this period, and if so, whether margins or turnover were responsible for the increase.

I find that aggregate average operating returns have remained relatively constant over the sample period. However, the stability of returns masks changes in its components. Average operating margin has increased, while average asset turnover has decreased. I also find that margin and turnover are negatively correlated, indicating that firms with higher margins generally have lower turnover. Although negatively correlated with each other, margin and turnover each are positively correlated with returns,

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demonstrating that both contribute to superior profitability. Margins exhibit more inter-firm variability than asset turnover and are more highly correlated with returns.

LITERATURE REVIEW

In a competitive, general equilibrium framework, industry profitability should trend to an economy-wide, long-run average (Fama & French, 2000; Scherer, 1980). Absent barriers to entry, industries with higher returns will attract competition, eliminating excess returns. However, firms within industries that have significant barriers to entry and a non-competitive market structure may be able to earn excess returns. The persistence of profitability and the sources of above average profitability have been extensively studied since Bain's (1951) seminal work. Using Compustat financial data, Mueller (1977) estimated a set of firm specific regressions with profit rates as the dependent variable and a deterministic, decaying time trend as the independent variable. The majority of firms with above average profit rates at the beginning of the sample period had negative coefficients, indicating decay in the profit rate. The majority of firms with below average profit rates at the beginning of the sample period had positive coefficients. These findings indicate that profit rates converge over time due to competitive pressures. However, for a significant number of firms, coefficients were either small or of the wrong sign, indicating that convergence may take place slowly or not at all.

Later work by Mueller (1986) used a stochastic time series model which estimated profit persistence using a first order autoregressive equation. This model has formed the basis of much subsequent research, including Mueller (1990), Geroski (1990) and Goddard and Wilson (1996). These studies have shown that for a typical firm, profits converge fairly quickly to the firm's long run equilibrium rate but that the long run rates of return differ significantly across firms. Fama and French (2000), using a partial adjustment model, estimate a 38 percent annual rate of mean reversion in profitability. Both firm and industry characteristics are important in explaining the persistence of profits. McGahan (1999), studying U.S. profit performance from 1981-1994, found that firm effects were more important in determining profitability than industry effects but that industry effects were more persistent.

Although profit persistence is widely studied, less attention has been focused on the components of operating profit. Most finance textbooks cover the method of disaggregating ROA into profit margin and asset turnover components. The disaggregation, attributed to F. Donaldson Brown of the DuPont Powder Company, allows an analyst to identify whether abnormal profitability is due to profit margin or asset utilization. Profit margin measures the proportion of sales dollars realized as net income. Asset turnover measures the ability of each dollar of assets to generate a dollar in sales. Increasing either turnover or margin increases ROA.

In a competitive, general-equilibrium framework, risk-adjusted ROA trends to an economy-wide constant, implying that profit margin and asset turnover are inversely related. In fact, if all firms earned the same return, profit margin and asset turnover would be perfectly negatively correlated with each other and uncorrelated with ROA. As previously cited empirical studies have demonstrated, profitability rates differ between industries and between firms within industries. Although the general equilibrium assumption of equal profitability may be simplistic, many segments of the U.S. economy experience significant competitive pressures that eliminate long-run economic profits, and therefore, profit margin and asset turnover should be inversely correlated.

In their seminal study, Selling and Stickney (1989) documented inter-industry variation in profit margin and asset turnover using Compustat financial data from 1977 to 1986. As expected in competitive markets, they found a significant negative correlation between profit margin and asset turnover; industries with high (low) profit margin usually have low (high) asset turnover. Selling and Stickney (1989) found that firms with above average profit performance have higher profit margin and/or higher asset turnover than the typical firm. They attribute the high margins to two factors. First, firms with high asset requirements need to have a sufficient return to attract capital. It follows from the accounting identity, that firms with low turnover need to have higher margins to achieve the same return as firms with higher turnover. Even with no barriers to entry, industries with large capital requirements will have higher profit margins in order to achieve an average return. Since profit margin for the unleveraged firm is the percentage of sales revenue that flows back to the providers of capital and capital-intensive production processes use more capital relative to other inputs, the providers of capital should claim a larger share of revenue. Capital intensity, in this context, refers to the amount of assets needed to supports sales, the reciprocal of total asset turnover, and includes fixed, current and intangible assets.

Selling and Stickney (1989) identified lack of competition as the second reason why low turnover industries achieve higher margins. Capital intensity may create barriers to entry that allow capital-intensive firms to earn superior margins. Much of the profit persistence literature examines competition and abnormal profitability, but most studies generally use concentration as a proxy for competition. Waring (1986) used both concentration and capital intensity in a profit persistence regression. Concentration was found to be positively related to persistence, while capital intensity was found to be negatively related to persistence.

Qualls (1974) and Selling and Stickney (1990) note that leverage lowers ROA because interest payments reduce net income. Therefore, ROA commingles operational performance with capital structure decisions. Researchers studying profitability have added interest payments back to net income (Geroski 1990, Mueller 1977, 1986, Qualls 1974) or have used earnings before interest and taxes (EBIT) as the numerator (McGahan 1999, Blaine 1993) of ROA to neutralize the effects of financing decisions upon operating performance.

Since this study is concerned with the operational performance of firms and not with financing or tax management strategies, I follow McGahan (1999) and Blaine (1993) by using operating margin (EBIT/Sales) to measure profit margin and basic earning power (BEP), which is also operating return (EBIT/Assets), to measure ROA. The modified Dupont relationship for operational profitability becomes:

BEP = EBIT margin x Asset Turnover = EBIT/Assets **(1)**

DATA AND RESULTS:

Data were collected from the Compustat Active and Research files for non-financial members of the S&P 500. The S&P 500 companies were chosen instead of a broader set because of the impact that outliers would have on correlations using the margin and return ratios. To reduce survivor bias, a company is included in the data set for all years if it was a member of the S&P 500 at any point during the sample period. For example, ACF Industries was a member of the S&P 500 from December 1981 through June 1984, but data for the company are included for the entire sample period. This results in more than 500 observations per year. The equally-weighted averages, medians, standard deviations, and coefficients of variation (CV) for turnover, margin and return for 1982-1999 are given in Table 1.

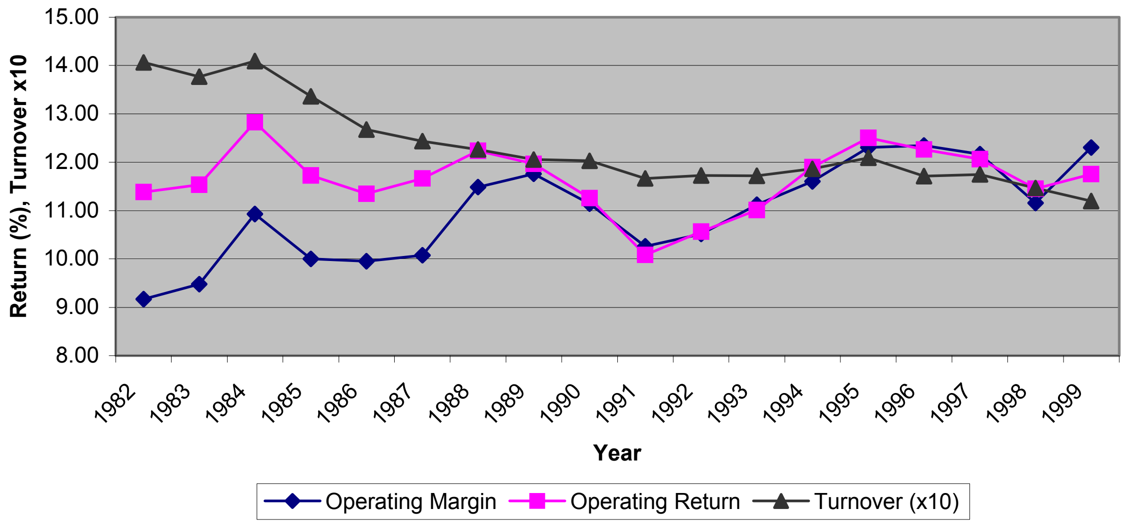
Table 1: Asset Turnover, Operating Margin and Operating Returns for S&P 500 Members

		Asset Turnover				Operating Margin				Operating Return on Assets			
Year	Firms	Mean	Median	Sigma	CV	Mean	Median	Sigma	CV	Mean	Median	Sigma	CV
1982	662	1.41	1.24	0.95	0.68	9.17	8.43	12.98	1.42	11.38	10.89	8.99	0.79
1983	661	1.38	1.18	0.98	0.71	9.48	9.03	16.26	1.72	11.53	11.03	8.65	0.75
1984	643	1.41	1.25	0.95	0.68	10.93	10.07	11.32	1.04	12.83	11.85	8.74	0.68
1985	640	1.34	1.18	0.90	0.67	10.00	9.36	11.90	1.19	11.73	10.59	9.81	0.84
1986	636	1.27	1.11	0.86	0.68	9.95	9.13	12.14	1.22	11.35	10.46	10.60	0.93
1987	629	1.24	1.08	0.84	0.67	10.08	10.20	17.99	1.78	11.66	10.75	9.68	0.83
1988	625	1.23	1.07	0.81	0.66	11.48	10.49	10.51	0.92	12.24	11.01	9.39	0.77
1989	614	1.21	1.08	0.80	0.67	11.76	10.69	8.96	0.76	11.97	10.37	9.07	0.76
1990	607	1.20	1.07	0.80	0.67	11.14	9.91	10.02	0.90	11.26	9.65	8.64	0.77
1991	606	1.17	1.03	0.79	0.68	10.26	8.83	10.10	0.98	10.08	8.92	8.96	0.89
1992	617	1.17	1.04	0.78	0.66	10.52	9.16	10.20	0.97	10.56	9.09	9.03	0.85
1993	617	1.17	1.01	0.80	0.68	11.12	9.70	10.70	0.96	11.01	9.49	9.03	0.82
1994	612	1.19	1.05	0.79	0.67	11.60	10.53	12.74	1.10	11.90	10.23	9.32	0.78
1995	599	1.21	1.06	0.79	0.65	12.31	11.56	12.73	1.03	12.50	11.04	9.45	0.76
1996	598	1.17	1.07	0.75	0.64	12.35	11.30	13.70	1.11	12.26	10.95	9.40	0.77
1997	584	1.17	1.01	0.76	0.65	12.17	11.38	12.72	1.05	12.06	11.07	9.41	0.78
1998	564	1.15	0.99	0.77	0.67	11.15	10.88	15.05	1.35	11.45	10.77	9.53	0.83
1999	534	1.12	0.95	0.78	0.70	12.31	11.49	11.75	0.95	11.75	10.44	9.45	0.80

Note that although return (BEP) is the product of margin (EBITM) and asset turnover, mean BEP does not equal the product of mean EBITM and mean asset turnover because the average of the products does not equal the product of the averages. The number of observations exceeds 500 for all years since data include firms that were members of the S&P 500 between the years 1982 and 1999.

The operating margins are consistent with those reported by Blaine (1993) using the Disclosure/Worldscope data base. As depicted in Figure 1, operating margin appears to be increasing, asset turnover decreasing and operating return appears trendless.

Figure 1
Mean Operating Return, Margin & Asset Turnover



The summary data were regressed against time to indicate whether statistically significant trends exist. The following regression equation was estimated for average EBIT margin, asset turnover and BEP:

$$Y_t = \beta_0 + \beta_1 t + \varepsilon_t \qquad \textbf{(2)}$$

The null hypothesis of β_1=0 implies a stationary, or trendless series. A significant β_1 results in a rejection of the null hypothesis. A positive β_1 indicates an increasing trend; a negative coefficient indicates a decreasing trend. The results for each of the regressions appear in Table 2.

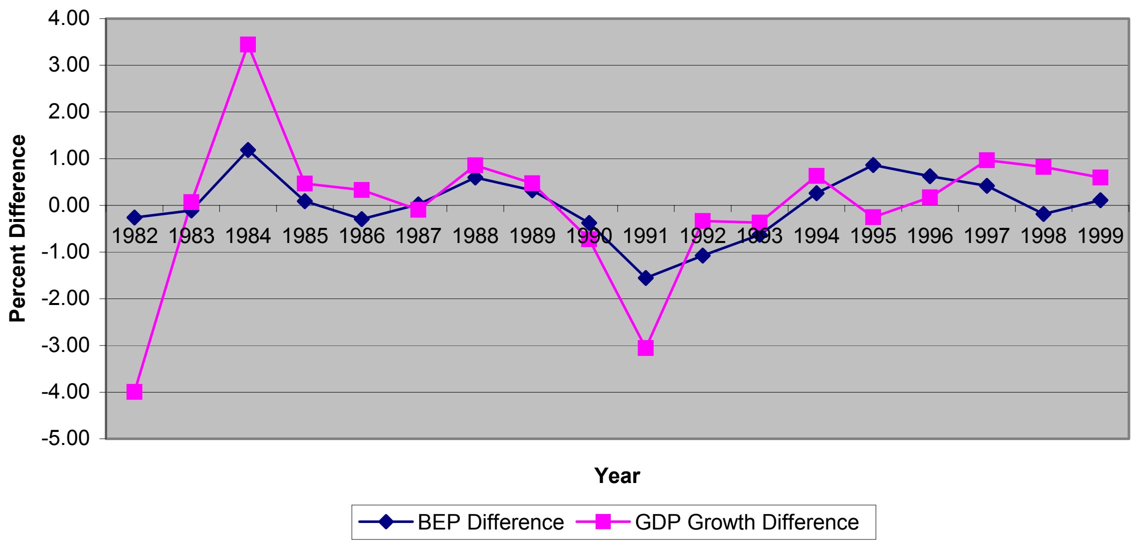
Table 2: Time Trend Regression for mean values 1982-1999.

	EBITM	AT	BEP
Coefficient	0.150	-0.015	0.002
Standard Error	0.028	0.002	0.031
t Stat	5.29	-7.788	0.511
P-value	0.00	0.000	0.960
Multiple R	0.797	0.890	0.013
R Square	0.636	0.791	0.000
Adjusted R Square	0.614	0.778	-0.062
Standard Error	0.640	0.042	0.689

The coefficient for BEP is not statistically significant and the regression has an R^2 of nearly zero. The regression indicates that the operational return on assets (BEP) has remained trendless during the sample period. The nominal return available to the government, debt providers and stockholders has remained relatively constant over the sample period, which is surprising considering the diversity of economic conditions from 1982-1999.

Operating returns exhibit obvious cyclical variation, which becomes evident from graphing the difference between annual returns and the average annual return (11.4 percent). Figure 2 graphs this difference along with the difference between annual GDP growth and its average for the period (2.37 percent). As expected, operating returns are closely linked to GDP growth, but surprisingly, they vary less than GDP growth.

Figure 2
Difference Between BEP and GDP from Average Values



While total return has remained fairly constant, its components have changed. EBIT margin has a statistically significant, positive coefficient and asset turnover has a statistically significant negative coefficient. Both regressions have very high R^2 values, the R^2 for turnover being higher because of the greater cyclical variation in operating margin. The competitive market explanation for the trends is that asset requirements have increased, per dollar of sales, and therefore a larger share of sales revenue flows to the providers of capital, resulting in a higher operating profit margin. An alternative, although probably less likely, explanation is that increasing profit margins create slack which allows firms to partake in wasteful expenditures. A 1941 note by Kaldor and Robinson (2000) identify this as a problem with high profit margins but it would seem that this problem would be more likely to occur within a particular industry than across the economy as a whole.

Although the data indicate that asset requirements for sales have increased, anecdotal evidence shows that asset requirements are subject to opposing forces. On the one hand, capital deepening would contribute to increased asset requirements. On the other hand; capital productivity increases should reduce asset requirements. As Oliner and Sichel (2000) indicate, capital deepening from 1970 to 1999 has resulted in an annual increase in labor productivity of between 0.62 to 1.10 percent. American workers, from physicians to retail clerks to teachers, have more tools available to them. Capital deepening increases the assets necessary to generate sales, resulting in a decrease in asset turnover.

Capital productivity increases, which can take the form of improved equipment or improved processes that increase the utilization of assets, offset capital deepening. The 1982-1999 period witnessed a cornucopia of both types of innovations. Advances in computer circuitry reduced the cost of information technology, which led to improvements in a variety of equipment. Information technology advances also supported improved processes, which changed the way that firms conducted their business (Brynjolfsson & Hitt 2000). Examples include just in time production (JIT) and consolidated zero-balance accounts. Both innovations decrease current asset requirements: JIT through inventory and consolidated zero-balance accounts through cash and equivalents.

A study of individual industries would probably reveal that some industries have increased capital requirements, while others have lower capital requirements, depending upon the relative strength of capital deepening versus capital productivity. Overall, for this sample, asset turnover has steadily decreased. In fact, with an R^2 of 0.791, the time trend regression indicates a very strong and persistent decrease in asset turnover.

Table 3 shows the correlation of average margin, turnover and return for each year (1982-1999).

Table 3: Correlation for Annual Averages (1982-1999)

	EBITM	*AT*	*BEP*
EBITM	1.000		
AT	-0.667	1.000	
BEP	0.486	0.256	1.000

The strong negative correlation between margins and turnover (-0.6617) far exceeds the –0.213 average of the cross-sectional correlations, listed in the first column of Table 4. Two factors account for the disparity between the cross-sectional and time-series correlations. First, cross-sectional correlations are lower because superior firms achieve above average profitability through higher margins and/or higher turnover. Second, the intertemporal stability of returns leads to a substantial negative correlation among the time series because the increase in margin is accompanied by a decrease in turnover. Operating profitability fluctuates around 11.6 percent, despite increasing margins. It would be interesting to determine whether increased margins bring about greater asset intensity, and thus lower turnover, or whether greater asset intensity gives rise to higher margins. Alternatively, since equally-weighted averages are used, and the set of firms is not constant, the results could be due to an increase in the number of high margin, low turnover firms relative to the number of low margin, low turnover firms. This last explanation can be ruled out because similar results were obtained when the analysis was conducted with the 304 firms that had complete data for the 1982-1999 period. Turnover increased and margin decreased by roughly the same magnitude, while the composition of firms remained constant. Although beyond the scope of this study, National Income and Product Account data could conclusively test whether asset intensity has increased economy wide or only for the S&P 500 set of firms.

Table 4. Correlation Between Margin, Turnover and Return

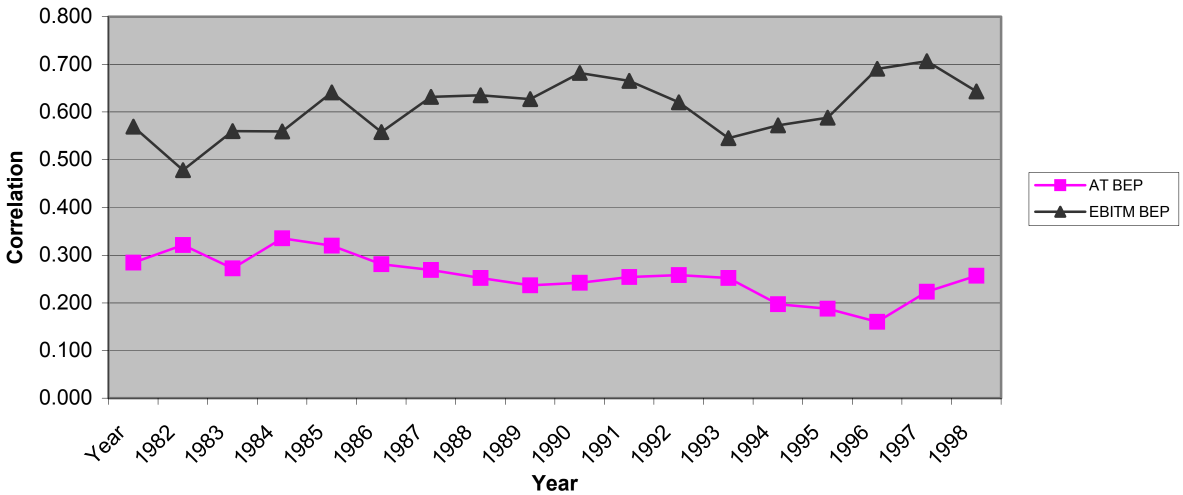
Year	EBITM AT	EBITM BEP	AT BEP
1982	-0.168	0.569	0.284
1983	-0.092*	0.478	0.321
1984	-0.207	0.560	0.272
1985	-0.171	0.559	0.335
1986	-0.150*	0.641	0.320
1987	-0.066	0.558	0.281
1988	-0.209	0.632	0.269
1989	-0.308	0.635	0.252
1990	-0.366	0.627	0.237
1991	-0.241	0.682	0.242
1992	-0.281	0.665	0.254
1993	-0.241	0.620	0.258
1994	-0.202	0.545	0.252
1995	-0.254	0.572	0.197
1996	-0.220	0.588	0.188
1997	-0.237	0.691	0.160
1998	-0.188	0.707	0.223
1999	-0.266	0.643	0.257

All correlations are significant at the 0.01 significance level except for *.

In a competitive environment, firms with more intensive capital requirements per dollar in sales should, *ceteris paribus*, have higher margins. Conversely, lower capital requirements should correspond to lower margins. Table 4 presents the cross-sectional correlation between margins (EBITM), turnover (AT), and return (BEP) for each year in the study period. As expected, margins and turnover are negatively correlated. The correlations are significant at the 0.01 level except for the 1983 and 1986 EBITM x AT correlation . In general, firms with higher (lower) turnover have lower (higher) margins, which is most likely explained by an industry effect. As noted by Selling and Stickney (1989), industries with high capital requirements generally have higher margin. The -0.21 average of the cross-sectional margin:turnover correlations, is significantly different from the –1.0 correlation that would occur if firms earned the same operating return.

The positive correlation between both margin and turnover and return supports the conclusion that superior performance is based upon either higher margin or higher turnover. The correlations are significant for all years at the 0.01 level. Returns are more highly correlated with margins, which may indicate that pursuing a high margin strategy is more successful than a high turnover strategy. The higher correlation may also indicate that industries with high capital requirements earn a higher return than those with lower capital levels. Alternatively, the strong correlation between return and margin may simply reflect the larger variability of margins, which have nearly twice the CV of turnover. However, examining the graph of annual correlations in Figure 3, one notices that not only is the return correlation approximately twice as large, but that the correlation shows an increasing trend, even though the CV of operating return is decreasing. If the stronger correlation with returns was due to the higher variability of margins, one would expect that the correlation would fall as the CV of margins fell.

Figure 3
Annual Correlations: Operating Return vs. Margin & Turnover



CONCLUSION

This study found a steady decrease in asset turnover from 1982 through 1999 has been offset by an increase in operating margin, resulting in no significant trend in operating return. More assets are necessary to support sales but return on assets is maintained through higher margins. Further research could ascertain the motivating force behind these trends. Does an increase in asset requirements lead to higher margins or do higher margins allow lower turnover? Or is the trend due to changes in accounting or tax regulations? If the trend exists because of economic forces, should we expect a continued increase in margins and decrease in turnover?

This study also found that profit margin and asset turnover jointly contribute to operational profitability. Profit margin is more highly correlated with returns than turnover and the strength of the correlation increased during the sample period. Further research should explore whether these results hold for a more comprehensive sample of firms. Additional research could also determine whether the results are consistent across sectors or whether some sectors have increased asset turnover.

Further work should also identify the extent of systematic and non-systematic factors affecting margins and turnover. This study showed that operating returns are highly correlated with changes in GDP growth, but other factors, such as inflation and interest rates, should also prove significant. Since operating returns provide the foundation for financial asset returns, analyzing sources of operating profitability presents rich research possibilities.

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FACTORS DETERMINING CREDIT UNION LOAN RATES IN LOCAL MARKETS

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ABSTRACT

This study uses a variant of the structure-performance model, often used in banking studies, to examine the credit union industries in Idaho and Montana. This should be of interest since credit unions have recently been the fastest growing type of depository institution. The used vehicle loan rate is the dependent variable. We found that credit union size, a proxy measure of economies of scale, and bank market share had negative and significant effects on loan rates. Credit union charge-offs, three-firm concentration ratios, higher salaries and a measure of credit union inefficiency led to significantly higher rates.

FACTORS DETERMINING CREDIT UNION LOAN RATES IN LOCAL MARKETS

Numerous past studies have examined bank structure. Most of these have used the structure-performance paradigm, which hypothesizes that banks in more concentrated markets may find collusion easier, leading to results such as higher profits, lower interest rates paid on deposits and higher interest rates changed on loans. For example, Gilbert (1984) wrote a survey of 44 bank structure studies published during the time period of 1964 to 1983. Tokle (2000) wrote a survey of eleven studies published during the time period of 1979 to 2001 that examined the effect of thrift competition on bank performance. Most of these studies used a structure-performance model.

However, our literature search did not turn up any studies using the structure-performance model for credit unions.[1] This is probably because the banking industry is much larger than the credit union industry, resulting in less interest in credit unions. However, the credit union industry has recently been growing faster than the banking industry. For example, from 1970 to 1999, banking assets grew by 139 percent in real terms, compared to 433 percent for credit union assets (Mishkin 2001, p. 39 and authors' calculations). Another measure of growth shows that the credit union membership-to-U.S. population ratio increased from just 3 percent in 1950 to 28 percent in 1999 (Credit Union Administration and Affiliates: Credit Union Report, 1999 Year-End and U.S. Census). Much of this growth is due to the fact that credit unions have become more like banks in terms of assets and liabilities. For example, until the 1970s, credit unions typically offered only savings accounts on their liability side and consumer loans on their asset side. Today, they often offer checking, money market deposits, and certificates of deposit on their liability side as well as credit cards and mortgages (primary and secondary) on their asset side.

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This study applies a variant of the structure-performance type model to credit unions in Idaho and Montana. We include some traditional independent variables, as well as some new ones to try to determine the factors that influence credit union structure and performance.

1. The Model and Data

The focus of this study is to examine variables that influence interest rates that credit unions charge for used vehicle loans in Idaho and Montana. Used vehicle loan rates were used because this rate is largely determined in local markets and virtually all credit unions offer this type of loan. Data were obtained from the NCUA (National Credit Union Administration) website. Feinberg (2001) used a model where the dependent variable was 24-month unsecured loans and 48-month new vehicle loans for banks in small and medium-sized local lending markets; he selected these dependent variables because they "seem most likely to be provided in a local market." Since the auto companies do more financing of new autos than used autos, used auto-lending markets should be even more local in nature than new auto lending.

The interest rates for used vehicle loans are measured by credit union. The following variables are hypothesized to affect these used vehicle loan rates. All variables, unless otherwise indicated, will be tested with one-tailed tests. Also, all variables are also measured by credit union, except for the market concentration and bank market share, which are measured by local market.

CONCENTRATION (CR3)

According to the structure-performance hypothesis, depository institutions in more concentrated markets may collude, either explicitly or implicitly, to charge higher interest rates on loans. This hypothesis has been used in many bank structure studies. For example, Berger and Hannan (1989) hypothesized that higher three-firm bank concentration ratios would lead to lower interest rates paid on bank deposits. Feinberg (2001) hypothesized that higher two-firm bank concentration ratios would lead to higher interest rates charged on loans. The three-firm concentration ratio (CR3) for each local market was used to measure credit union concentration and was hypothesized to have a positive effect on loans rates; that is, the higher the combined market share of the three largest credit unions, the higher the loan rates charged. It was calculated from June 1997 NCUA data.[2]

BANK COMPETITION (BANKSHARE)

The biggest competitors of credit unions for used auto loans are other credit unions and commercial banks. Hence, we use a bank competition variable that was computed as the bank market share for deposits, or as total bank deposits divided by total bank plus credit union deposits for each market. Increases in bank market share could increase credit union competition from banks and lead to lower credit union rates on used auto loans. In a couple of recent papers, higher credit union market share was hypothesized to lead to higher rates paid by bankers on some deposits and lower rates charged by bankers on some loans. In their study on bank structure, Tokle and Tokle (2000) hypothesized that higher credit union market share and higher S&L market share would increase competition for banks and lead to higher bank deposit rates. And Feinberg (2001) hypothesized that a higher credit union market share would lead to lower rates for new auto and unsecured bank loans. So, our hypothesis uses a similar reasoning, but tests for the effect of bank market share on credit union used auto loan rates. Credit union deposit data come from the NCUA,[3] while bank deposit data come from the FDIC. Both data sources are for June 1997.

CREDIT UNION DEPOSIT GROWTH (CUGROWTH)

Credit union growth is measured by the past year's percentage change (from June 1996 to June 1997) in total deposits for each credit union, which come from the NCUA. It may indicate stronger demand for the institution's services, which may then be able to charge higher rates on loans. Hence, CUGROWTH is hypothesized to have a positive effect on loan rates. It is modeled with an interactive term with BANKSHARE.

CREDIT UNION SIZE (CUSIZE)

In banking studies, bank size has been used as a proxy measure for economies of scale (see Hannan, 1984; Barret and Unger, 1991; and Hannan and Liang, 1995). If economies of scale are present, an increase in depository institution size will result in lower average costs, which may be passed on in lower loan rates. Hence, CUSIZE is hypothesized to have a negative sign. It was calculated as June 30, 1997 deposits, in millions, for all branches of the credit unions, and was obtained from NCUA.

WAGE RATE (SALARY)

The credit union wage rate variable, SALARY, was calculated as the average salary plus benefits as of June 30, 1997, in thousands of dollars, for full-time employees[4], and was obtained from NCUA for each credit union. We used the same hypothesis that Calem and Carlino (1991) used in their banking structure study. On one hand, higher wages may reflect higher costs and hence higher loan rates; on the other hand, higher wages may reflect higher worker productivity and consequently lead to lower loan rates. Thus, salary has no predicted sign, and will be tested with a two-tailed test.

The following two variables, which are indicative of the financial health of the credit union, were obtained from the NCUA and represent conditions as of June 30, 1997.

NET CHARGE-OFFS/AVERAGE LOANS (CHARGE)

Net charge-offs as a proportion of average loans is a key CAMEL ratio. CAMEL ratios refer to Capital Adequacy, Asset Quality, Management, Earnings, and Liquidity, and are used by regulators to assess a credit union's financial condition. This would be the National Credit Union Administration (NCUA) for federally chartered credit unions. Net charge-offs-to-average loans is measured as the total of loans charged off in the prior 12-month period, minus total recoveries, divided by average total loans.

An increase in the amount of charge-offs results in higher expenses, and should lead to higher loan rates.[5] Consequently, CHARGE is expected to have a positive effect on used vehicle loan rates.

EFFICIENCY MEASURE (EFF)

One measure of a credit union's efficiency is EFF, which is the number of full time employees per one million dollars in loans. The more employees it takes to process loans (a labor intensive process), the less efficient it would be. This would also capture efficiencies that credit unions obtain from making larger average sized loans. Since the loan processing is similar for large or small loans, credit unions that make on average larger loans have an efficiency advantage. EFF, or variations such as full time employees per one million in loans and checking, are commonly used by credit unions to measure their own efficiency. The larger EFF is, the less efficient is the credit union, which should result in higher loan rates. Hence, EFF is hypothesized to have a positive sign.

The structure-performance model used in this study is:

Used vehicle loan rate = b_0 + b_1CR3 + b_2BANKSHARE + b_3 CUGROWTH+
b_4BANKSHARE*CUGROWTH + b_5CUSIZE+ b_6SALARY + b_7CHARGE + b_8EFF.

Means and standard deviations of the variables are shown in Table 1. A table of the cities included in the sample and their populations is shown in the appendix.

Table 1. Mean and standard deviation of variables. (n = 112)

Variable symbol	Variable definition	Mean	Standard deviation
USEDV	Used vehicle loan rate, basis points	954.35	106.34
CR3	Three-firm concentration ratio	75.24	17.04
BANKSHARE	Market share of banks, %	72.37	9.78
CUGROWTH	Market (share) growth	10.69	13.24
CUSIZE	Credit union deposits, in $ millions	20.37	27.01
SALARY	Average salary and benefits of full-time employees, $ thousands	25.62	6.48
CHARGE	Net charge-offs / average loans	0.56	1.59
EFF	Full-time employees per $1 million in loans	0.86	0.47

2. Sample

The sample consists of 112 credit unions in Montana and Idaho located in cities with a population of 8,000 or more for year-end 1996. The local market is taken to be these cities, rather than counties, because Montana and Idaho are sparsely populated rural states with large geographic counties that have cities quite far apart from each other. Cities that share a common boundary (twin cities) are included in the same market. The cities are listed in Appendix Table 1.

3. Results

The ordinary least squares regression results are reported in Table 2. The model is significant at the 1 percent level, and explains 28 percent of the variation in loan rates as measured by adjusted R squared. The dependent variable, USEDV, and CUSIZE are in natural logarithm form[6]. Standard errors of the coefficients were adjusted using the White procedure. All of the independent variables are significant at the ten percent level or better.

Table 2. OLS Regression Results. The natural log of used vehicle loan rate is the dependent variable.

Predictor	Coefficient	White Standard errors	p-value*
Constant	6.9003		
CR3	0.0009	0.00052	.0920
BANKSHARE	-0.0025	0.00141	.0812
CUGROWTH	-.0096	0.00551	.0819
BANKSHARE*CUGROWTH	0.0001	0.00007	.0433
lnCUSIZE	-0.0458	0.00749	<.0001
SALARY	0.0044	0.00200	.0277
CHARGE	0.0104	0.00360	.0041
EFF	0.0399	0.02067	.0536

R^2 = 33.3% Adjusted R^2 = 28.1%
F calculated = 6.42 (p-value <.0001)

*p-values are for χ^2, since White standard errors are asymptotic rather than exact.

The concentration ratio, CR3, appears to have a small but positive effect on used vehicle loan rates for this sample of credit unions. Hence, the structure-performance hypothesis, often used in banking studies, also applies to credit unions.

The larger the share of banks in the local market, the lower the loan rates offered by these credit unions. An increase in bank market share is expected to lower the used vehicle loan rate very slightly when evaluated at the mean CUGROWTH, and holding other factors constant. Hence, bank competition appears to have a small, but significant effect on credit union loan rates. In addition, an increase in

CUGROWTH is expected to increase the used vehicle loan rate by a small amount, evaluated at the mean BANKSHARE, and holding all else constant.

Economies of scale appear to affect loan rates in this sample of credit unions. For every ten percent increase in deposits, used vehicle loan rates fall by about one-half of one percent. This effect is significant at the 1 percent level. In addition, an increase in the average full-time employee salary causes loan rates to increase. This indicates that higher salaries increase expenses but do not necessarily reflect higher productivity.

Charge-offs as a proportion of average loans is one of the key “CAMEL” ratios used by NCUA in evaluating credit union asset performance and risk. An increase in charge-offs tends to increase loan rates. This indicates that a higher amount of charge-offs result in higher expenses, which are passed on to members in the form of higher loan rates.

The efficiency ratio, EFF, performs reasonably well in explaining variation in used vehicle loan rates. Recall that the larger EFF is, the less efficient is the credit union. As expected, this variable had a positive sign, which indicates that less efficient credit unions tend to charge more for loans.

4. Summary and Conclusion

Numerous past studies have examined bank structure. This study uses a variant of the structure-performance model commonly used in these banking studies to examine credit union structure and performance in Idaho and Montana. The dependent variable was used vehicle loan rates, a rate that is determined largely in local markets and is offered by virtually all credit unions. Of the seven independent variables, all had the hypothesized sign and were significant at the ten percent level or better.

A market concentration measure is often included in bank structure studies. Here, a credit union three-firm concentration ratio was positive as expected. Hence, it appears that even for non-profit firms such as credit unions, a higher industry concentration can lead to a less competitive result. And, the BANKSHARE variable had a negative and significant effect on loan rates, suggesting that bank competition may by itself lower credit union loan rates some. The credit union growth variable had a positive and significant effect on loan rates when evaluated at the mean level of BANKSHARE, which suggests that a credit union with stronger demand may charge higher rates, other factors equal in a typical local market.

The credit union size coefficient was negative and significant at the one percent level, suggesting the presence of economies-of-scale. The wage rate variable was also positive and significant. It appears higher wages lead to higher costs that lead to higher loan rates, rather than higher productivity that could lead to lower loan rates.

The net charge-off coefficient was positive and significant. Credit unions with higher charge-offs will have higher costs, which lead to higher loan rates. This also indicates the use of risk-based lending practices, which some credit unions have been adopting since the mid-1990s. With risk-based lending, credit unions score their loan applicants by risk, using sources such as credit reports. Then, they use these scores to categorize different risk groups, with the more risky group members paying higher loan rates.

Proponents of risk-based lending argue that it helps members as well as the credit unions. Higher-risk members may get some loans at the higher rate that the credit union feels it could not make at a lower rate. The alternatives for these members would be loans at higher rates from institutions such as finance companies or even pawnshops and pay-day loan lenders. And lower-risk members, who often shop for rates, may get lower rates than is possible with a single rate for all. And, the efficiency variable performed as expected: a more efficient operation translates into better loan rates.

Credit unions, as a group, are still much smaller than banks. However, they serve an increasing segment of our population and in the 1990s, they were the fastest growing type of depository institution. Future research should continue to explore the structure of credit unions.

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ENDNOTES

1. Two articles by Emmons and Schmid (1999 and 2000) use a model that is related to the structure-performance model to show that higher bank concentration increases credit union participation rates (measured for a credit union as members divided by potential members). Feinberg (2002) also uses a model that is similar to the structure-performance model. He examined in a regression model what effect the cost of funds, population size, concentration of the leading 2 non-credit-union institutions, credit union market share and a dummy variable for states with a credit union share greater than 10 percent have on credit union loan rates in 77 different local markets. Using a strict definition, this is not a structure-performance model since there is no measure of credit union concentration as an independent variable.
2. The FDIC reports deposits by city and by branch for banks and S&Ls. However, the NCUA reports deposits by credit union only, and not by city or branch. Twenty-two credit unions in Idaho and Montana had branches in more than one city in the sample and/or in other cities not in the sample (some were out of state, such as in Texas and New Jersey). Each of these credit unions had to be contacted individually to obtain their deposits by city in the sample. This was a time consuming process and required the cooperation of each CEO of these 22 credit unions to voluntarily give the authors these data.
3. ibid.
4. Full-time employees are defined as those working 26 hours per week or more.
5. In the fringe lending markets, which would include some or much of the business for pawn shops, payday lenders and finance companies, adverse selection may occur where the much higher loan interest rates (compared to credit unions) may attract borrowers who are more risky. But, interest rates on loans among credit unions don't vary nearly as much as between credit unions and pawn shops, payday lenders and finance companies. Hence, credit unions as a group are not involved in fringe market lending. So, we reason that higher charge offs and the higher risk associated with these loans lead to higher loan rates.
6. Both of these variables are in natural logarithm form. The loan rate is in logarithm form because of the implicit assumption of normally distributed error terms, and using the logarithm of firm size is common practice.

Appendix Table 1. Cities in the sample and their 1996 population.[a]

City	Population
Boise/Garden City, ID	161,451
Pocatello/Chubbuck, ID	60,172
Idaho Falls, ID	48,079
Nampa, ID	37,558
Twin Falls, ID	31,989
Coeur d'Alene, ID	31,076
Lewiston, ID	30,271
Caldwell, ID	21,089
Moscow, ID	20,101
Rexburg, ID	14,204
Blackfoot, ID	10,406
Burley/Heyburn, ID	12,183
Mountain Home, ID	8,988
Billings, MT	91,195
Great Falls, MT	57,758
Missoula, MT	51,204
Butte/Silver Bow, MT	34,051
Bozeman, MT	28,522
Helena, MT	27,982
Kalispell, MT	15,678
Havre, MT	10,232
Miles City, MT	10,057
Anaconda, MT	8,882

[a] Source: U.S. Census Bureau

THE CAUSAL RELATIONSHIP BETWEEN TAX REVENUES AND EXPENDITURES: EVIDENCE FROM NEW YORK STATE

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ABSTRACT

As smaller state budgets become popular among voters, a better understanding of the factors affecting budget balances becomes imperative. This paper tries to shed some light on the issue by analyzing New York State budget data. The results of a Granger-Causality test in conjunction with variance decomposition techniques show that tax revenues, as opposed to expenditures, are the leading factor in creating bigger budgets in New York.

INTRODUCTION

As the size of the federal government budget shrinks and the burden of social programs is shifted to the states, a clear understanding of the factors affecting state budget balances becomes imperative. This is especially true in the face of the recent public outcry for fiscal responsibility at the state level. Besides the peculiarities of state politics, there are a number of state level economic variables that are important in forecasting revenues and expenditures and, in general, managing the budget. Recent New York State budget surpluses following years of huge deficits have raised the important question of what is more relevant for fiscal responsibility: the revenue system, the institutionalized expenditures, or both?

The public finance literature offers three hypotheses about the growth of a government's budget. The first is that governments change expenditures and taxes concurrently (Meltzer & Richard, 1981). Under this hypothesis, the community determines the optimal level of spending and taxes by comparing the marginal benefits of government to its marginal cost. Under the second hypothesis, taxes lead government spending (Ward, 1982; VonFurstenberg et al., 1986). This hypothesis is based on political convenience rather than economic efficiency. It has been advanced traditionally in the analysis of revenue-constrained spending at state and local levels. The third hypothesis is that taxes may gradually adjust to expenditures (Peacock and Wiseman, 1979). It is conceivable that expenditure increases caused by a crisis or supported by a political majority would shift the revenue constraint.

There have been several causality tests of these hypotheses at the federal level. The results of the tests using federal data are mixed. For example, Blackley (1986) concluded that increases in tax revenues might not lead to smaller deficits. In contrast, VonFurstenberg et al. (1986) found that spending

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increases resulted in tax increases. There are only two state level studies, Joulfaian and Mookerjee (1989) on Massachusetts, and DeLoughy (1999) on Connecticut. Both studies show unidirectional causality running from revenues to expenditures. Perhaps, the reasons for the paucity of research at the state level are that budget deficits have only recently become an issue in the larger states and that appropriate data have not readily been available.

The purpose of the present study is to add to the body of empirical evidence on the causal relationship between government revenues and expenditures at the state level, using New York State as a case. More specifically, the Granger-Causality test (Granger, 1969) will be employed to find out whether the state's tax revenues lead (or are caused by) government expenditures. Such a finding should prove beneficial to state public policy makers in their effort to control budget growth.

EMPIRICAL ANALYSIS

To test whether revenues lead expenditures, expenditures lead revenues, revenues and expenditures are independent from one another, or revenues and expenditures are jointly determined, the basic Granger-Causality test was applied to 40 years worth of New York State data. More specifically, based on Granger (1969), the following empirical model was designed:

$$R_t = \sum_{j=1}^{n} a_j R_{t-j} + \sum_{i=1}^{m} b_i E_{t-i} + U_t \qquad (1)$$

$$E_t = \sum_{j=1}^{n} c_j E_{t-j} + \sum_{i=1}^{m} d_i R_{t-i} + V_t \qquad (2)$$

where R = Revenues, and E = Expenditures.

In the above equations if all the estimated coefficients are statistically significant, then revenue and expenditures lead one another (feedback effects). If, on the other hand, the coefficients are insignificant, revenues and expenditures are independent from one another. A statistically significant or insignificant coefficient of E in equation (1) above would imply that revenues lead or do not lead expenditures, respectively. In equation (2), if the coefficient of R is significant, then revenues are expected to lead expenditures, otherwise they do not.

Significance is determined via the Wald F test as follows:

$$F = \frac{(SSR_1 - SSR_2)/r}{SSR_2/(n-k)}$$

where SSR_1 is the sum of squared residuals from the restricted equation (when b_i or d_i are set equal to zero) and SSR_2 is the sum of squared residuals from the unrestricted equation, r is the number of restrictions, n is the number of observations, and k is the number of independent variables in the unrestricted equation. The Wald F test is a variation of the traditional F test. It is used to test the significance of a linear equality restriction in the coefficients of a regression model. A statistically significant F value means that the restricted and unrestricted regressions are different; hence one may reject the hypothesis that the parameters obey the linear restriction(s).

The data used here cover the period 1960-99. They were obtained from a series of reports published by the New York State Division of the Budget. New York has one of the largest and most complex budgets among the states. The state records its transactions in three fund types: Government, Proprietary, and Fiduciary. Among these, the Government Fund is the largest (more than 95 percent of the total) and is comprised of four categories. The first and the largest is the General Fund, which is the major operating fund of the state. The second is the Special Revenue Fund, which is used to account for state receipts from specific revenue sources such as Federal grants. The third is the Debt Service Fund, which is used to account for the accumulation of resources for, and the payment of, principal and interest on general long-term debt and payments under lease/purchase and contractual obligation financing agreements. The receipts and fund sources of the Capital Projects Fund, the fourth category of the Government Fund, are generated primarily from bond issues, dedicated taxes, and Federal grants.

For the purpose of the present study, the General Fund category was chosen because its sources and uses of funds are the most sensitive to changes in state tax and expenditure policies. The nominal values of annual receipts and payments net of Federal grants and adjusted for changes in accounting procedures over the period were used for this study. Table 1 reports the summary statistics of the studied variables.

Table 1. Descriptive Statistics (in millions) of Variables, 1960-99

	N	Minimum	Maximum	Mean	Std. Deviation
REV	40	$1828000.00	$36477682.00	$15967531.50	$11549877.20
EXP	40	$1827400.00	$35166032.00	$16252941.00	$11660995.60

Two null hypotheses, R does not Granger-cause E and E does not Granger-cause R, were tested using three lags of R and E. Previous studies indicated that a maximum of three lags is sufficient and appropriate for annual data (e.g., Joulfaian and Mookerjee, 1989). In addition, each of the variables is differenced by checking for the existence of unit roots that are indicative of non-stationary variables. A unit root exists in time series data when the mean or variance varies over time or is not finite (Grewal et al., 2001). It is important to test the unit roots before testing the causal relationships. Granger causality tests require data to be stationary. If this assumption is violated, the tests may produce spurious and misleading results (Grewal et al., 2001). Therefore, this study employed the Augmented Dickey and Fuller (ADF) test to examine the presence of unit roots. The ADF test results suggest the absence of a unit root for all variables when expressed in logarithmic first differences, satisfying the stationary variable assumption of Granger tests.

Table 2. Granger Causality Test Results

Variable	Estimated Coef.	Std. Error	t-statistic	P-value
REV(-1)	0.844	0.232	3.641	[.001]
REV(-2)	-0.199	0.263	-0.757	[.455]
REV(-3)	0.033	0.241	0.136	[.892]
EXP(-1)	0.179	0.223	0.800	[.430]
EXP(-2)	0.174	0.238	0.729	[.471]
EXP(-3)	-0.061	0.223	-0.272	[.788]
C	0.548	0.210	2.606	[.014]
F_1 =	**.7493 (p=.531)**			
REV(-1)	0.660	0.229	2.886	[.007]
REV(-2)	0.198	0.259	0.766	[.450]
REV(-3)	-0.080	0.238	-0.338	[.738]
EXP(-1)	0.533	0.220	2.419	[.022]
EXP(-2)	-0.105	0.235	-0.448	[.657]
EXP(-3)	-0.219	0.220	-0.995	[.328]
C	0.268	0.208	1.290	[.207]
F_2 =	**4.315 (p=.012)**			

Granger causality test results run by using TSP software are reported in Table 2. The following F statistics of Granger causality tests were calculated for equation 1 and 2: F_1 = 0.7493 (p= .531); F_2 = 4.3154 (p=.012) as indicated in Table 2. Since F_2 is significant at 5 percent level while F_1 is not, the first null hypothesis can be rejected while the second null hypothesis cannot be. In other words, the data seem to indicate that New York revenues are good predictors of expenditure levels, while expenditures do not Granger cause revenues in New York.

Recent application of Granger tests also computes the associated variance decomposition (VDC), since VDC can calibrate the strength of the causal relationship from Granger tests. The VDC is able to shed light on how much of the forecast error variance of the variable can be explained by its own innovations and how much by shocks to the other variables in the model (Darrat et al., 1996; Grewal et al., 2001). For instance, it answers question such as what percentage of the forecast error variance of New York State revenues can be attributed to government expenditures. Table 3 reports the VDC results for time horizons ranging from one to ten years.

Table 3. Variance Decomposition Test Results

	Time (Years later)	REV	EXP
REV	1	100.00	**0.00**
	2	98.98	**1.02**
	3	95.43	**4.57**
	4	94.00	**6.00**
	5	94.10	**5.90**
	6	94.39	**5.61**
	7	94.47	**5.53**
	8	94.43	**5.57**
	9	94.41	**5.59**
	10	94.41	**5.59**
EXP	1	**36.60**	63.40
	2	**62.37**	37.63
	3	**77.78**	22.22
	4	**83.05**	16.95
	5	**85.02**	14.98
	6	**86.02**	13.98
	7	**86.89**	13.11
	8	**87.68**	12.32
	9	**88.29**	11.71
	10	**88.74**	11.26

It can be noted that the effects of expenditures (EXP) on revenues (REV) are very small and not significant. Expenditures explain nothing of the first year variance of revenues. The predicting effects increase slightly but are still less than 6 percent at the end of ten years. On the other hand, the effects of revenues on expenditure are far larger and significant, increasing from 36 percent in the first year to 88 percent in the end of ten years as shown in Table 3. Therefore, the VDC results further confirm that New York State revenues lead expenditure levels without any feedback.

SUMMARY AND CONCLUSION

As smaller state budgets become popular among voters, a better understanding of the factors affecting budget balance has become imperative. The results of a Granger-Causality test applied to New York State budget data of the past three decades shed some light on the issue. According to these results, tax revenues rather than expenditures seem to be a leading factor in creating bigger budgets in New York. The policy implication is that the best remedy for balancing the budget and reining in expenditures is to cut taxes. There are, however, two major factors that could hinder the effectiveness or appropriateness of the remedy. Historically, the effectiveness of tax cuts as a means of reducing New York State budget deficits has often been undercut by state borrowing. Although, the state constitution requires balanced budget and limits the use of borrowed funds, the Government has been enormously resourceful in finding ways around these restrictions. The second is that the appropriateness of tax cuts in dealing with budget deficits depends on the timing of such cuts vis-à-vis business cycles. It can be argued that deep tax cuts during an upswing might provide unnecessary fuel for inflationary forces (or vice versa during a downturn).

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INCREASING BLOCK TRANSACTIONS AND STOCK MARKET BEHAVIOR

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ABSTRACT

An increasing volume of experienced trading tends to reduce autocorrelation and make the market more efficient. Autocorrelation in daily returns changes over time and the changes were less frequent than would be expected if the changes were random, but the changes are random recently. Autocorrelation has a negative connection with rate of return. The relation between autocorrelation and trading volume is positive and nonlinear.

Key words: experience, autocorrelation, block transaction, volume

INTRODUCTION

There is a large literature that shows evidence of deviations of stock return behavior from a simple random walk or from the weak form efficient market hypothesis. For example, Fama (1965) investigates the behavior of the daily closing prices of the 30 Dow Jones Industrials and finds the first-order autocorrelation of daily returns are positive for 23 of the 30 firms, which suggests a positive relationship between successive daily returns. However, the results of his runs tests show that the actual number of runs in four-, nine- and sixteen-day cases are almost identical to what is expected. Lo and MacKinlay (1988) find that weekly returns on portfolios of NYSE stocks show consistent positive autocorrelation, and the autocorrelation is stronger for portfolios of small companies. Similarly, Conrad and Kaul (1988) find that daily and Wednesday-to-Wednesday returns are positively autocorrelated, especially for portfolios of small stocks.

Campbell, Grossman, and Wang (1993) test daily returns on a value-weighted index of stocks on the New York and American Stock Exchanges. They find that first-order autocorrelation tends to decline as volume increases.

In contrast, there is no work relating an increase in the level of investors' experience to stock market behavior. It is possible that, over time, as investors' understanding of financial markets and financial instruments improves, they gain the ability to promptly analyze and rationally use relevant information in forming their trading strategies. In the markets, the number of better-educated and more experienced investors has been growing rapidly over the last few decades. One might expect that this increasing level of investor experience would have an impact on market behavior.

Financial economists generally believe that developed markets are more efficient and less volatile than less developed and emerging markets. However, the comparison is made for similar time periods. Logically, one might ask whether a market becomes more efficient and less volatile as it develops and its

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investors become more experienced. Recently, Gu (2001) and Gu and Finnerty (2002) point out that autocorrelation in the U.S. stock indices exhibits a downward trend over the last twenty-six years.

Further, though many previous studies found significant autocorrelation in stock returns, none has reported that an excess return could be made based on estimated autocorrelation, because of "transaction costs." However, more important reasons may be that actual autocorrelation changes over time or that the changes are random. The estimated autocorrelation would not offer adequate information about dependency in price movements if actual autocorrelation changes over time. The market would still be weak form efficient if the changes are random, because investors cannot forecast the market using the estimated autocorrelation, or, historical autocorrelation patterns provide no information that could be used as the basis for a trading strategy.

In this study, I examine the effects of experienced investors' trading activities, which is approximated by the volume of block transactions, on market behavior. I also look at the relations between rate of return, trading volume, and autocorrelation. I hypothesize that more experienced trading activities tend to make the market more efficient.

The plan of the paper is as follows. Section I describes the data. Section II presents the methodology and the estimated autocorrelation. Section III analyzes the relation between experienced trading activities, return, volume, and autocorrelation. Section IV provides conclusions.

I. THE DATA

It is extremely difficult, if not impossible, to obtain a measure of investors' experience. To approximate advances in investors' experience I use the annual volume of block transaction data that is available from 1965 to 1999. The rapid growth of block transactions indicates the rapid growth of professional trading activities. The daily index of the Dow Jones Industrial Average for the same period is from the Dow Jones Company. The Dow Jones Index has a history of over a hundred years. Its daily data is appropriate for evaluation over a long time frame for the purpose of this study. Stocks in the Dow are generally the most closely watched, the information about them is intensive, and their trading volumes are very large. Hence, the Dow Index is generally regarded as the most efficient portfolio in the world. Also, the Dow Jones Industrial Average Index represents the most well known large stock price index, options and futures on the index started trading on October 6, 1997. Study on the behavior of the index may help investors to develop better investment strategies.

II. THE RUNS TESTS

Runs tests are performed to test autocorrelation between successive daily returns on the Dow Jones Industrial Average Index over the period. The runs test is also used to test the (non)randomness of changes in autocorrelation. The use of a short (daily) horizon may reduce the cost of statistical imprecision. The runs test is a non-parametric test used to detect the frequency of changes in the direction of a time series. As it is a non-parametric test, the runs test is not based on any finite-variance assumption and does not require a normal distribution. Runs are defined here as the number of sequences of consecutive positive and non-positive (negative or zero) returns. The rate of return is calculated in terms of the difference of their natural logarithms, which gives the continuous compounding rate of return, as below:

$$R_t = \ln P_t - \ln P_{t-1} \qquad (1)$$

where R_t = the rate of return during interval *t*,

P_t = the value of the index at the end of period *t*, and

P_{t-1} = the value of the index at the end of period *t* - 1.

The runs tests tabulate and compare the number of runs in the sample against its sampling distribution under the random walk hypothesis. Suppose that each observation is independently and identically distributed, when the null hypothesis of randomness is true, according to Albright (1987), the mean or expected number of runs can be calculated as

$$E(R) = \frac{N + 2AB}{N} \qquad (2)$$

where N = total number of positive and non-positive sequences in the sample,

A = number of sequences of positive returns in the sample, and

B = number of sequences of negative or zero returns in the sample

The standard error of number of runs can be calculated as

$$SE(R) = \sqrt{\frac{2AB(2AB - N)}{N^2(N-1)}} \qquad (3)$$

To test whether any apparent non-randomness is the result of chance alone, we use the statistic,

$$Z = \frac{R - E(R)}{SE(R)} \qquad (4)$$

where, R = number of actual runs in the sample.

The null hypothesis, H_0 (randomness) can be rejected at the α level if $|z| > \alpha_{z/2}$. The test is a two-tailed test since there is evidence of non-randomness when R is too small or when R is too large. For a two-tailed test with $\alpha = 0.10$, the tabulated z value required is $z_{0.05} = 1.645$, with $\alpha = 0.05$, the tabulated z value required is $z_{0.025} = 1.96$.

Since the runs ratio is defined as the actual number of runs divided by the expected number of runs, it measures the relative departure from randomness. Negative z-values of the runs tests and runs ratios less than unity indicate positive autocorrelation or that price increases or decreases occur in streams. Positive z-values and runs ratios greater than unity indicate negative autocorrelation or that the index changes directions more frequently than random chance would indicate. A runs ratio equal to unity indicates randomness.

Results of the tests reveal significant autocorrelation for less than half of the 34 years, which is supported by the z-values for the runs tests. In addition, the returns exhibit positive autocorrelation during years with higher autocorrelation, but exhibit negative autocorrelation during years with lower autocorrelation. Table 1 presents the descriptive statistics of the estimated autocorrelation and Figure 1 shows each year's estimated absolute autocorrelation for the period. As shown in the figure, autocorrelation changes every year and autocorrelation from 1965 to 1975 is much higher than from 1976 to 1999.

Table 1

Descriptive Statistics of the Estimated Autocorrelation

Runs ratio is defined as the actual number of runs divided by the expected number of runs. Less-than-unity runs ratios indicate positive autocorrelation or that price increases or decreases in streams.

1965 – 1999	Mean	Stdev.	Maximum	Minimum
Runs Ratio	0.9437	0.0952	0.7677	1.1197
Z(absolute value)	1.3852	1.0787	3.7175	0.0090

Further, the runs test reveals that autocorrelation changes less frequently than would be expected if the changes were random. The z-value of the runs test is negative 2.264, which indicates that autocorrelation increases or decreases in streams during the 34 years. The nonrandom changes in autocorrelation further confirm that the market is not weak form efficient in years with high levels of autocorrelation. However, autocorrelation changes became random recently, which is another indicator that the market gained efficiency.

III. AUTOCORRELATION AND RELATED FACTORS

Regression analysis is conducted to examine the impact of experienced investors' trading activities on autocorrelation and the relations between rate of return, trading volume and autocorrelation. In the model, the absolute value of the estimated runs ratios minus 1 is used as the dependent variable. The absolute value of the dependency measurements can measure the extent of deviation from randomness with the same scale, and reveals both the direction and magnitude of the effects of the independent variables on the level of autocorrelation. The natural logarithm of annual block transaction volume (*lnblktrans*), annual average rate of daily return, and the natural logarithm of annual average of daily trading volume are used as independent variables.

Table 2 presents the results of the regression analyses. There is a significant negative connection between block transaction volume or experienced investors' trading activities and autocorrelation. The negative connection between block transaction and autocorrelation may indicate that more experienced trading activities in general can help to reduce autocorrelation or make the market more efficient.

Investors have gained more knowledge about the stock market since World War II. The number of well-educated financial analysts (MBAs, CFAs, technical analysts and PhDs) has been growing rapidly. Several financial economists have won the Nobel Prize. To further explain the negative connection between investors' experience and autocorrelation, we may use the growth in block transactions as indicators. Block transactions (transactions involving at least 10,000 shares) grew from only 3.1 percent of reported volume on the New York Stock Exchange in 1965 to over 60 percent in 1999[1]. Block traders are mainly institutions. Institutional investors are generally among the most experienced and best-informed market participants. The rapid increase in their holding and trading of stocks indicates a greater proportion of mature trading activities. In the mid-1990s, institutional holdings of stocks crossed the 50 percent threshold. Institutions have highly disciplined analysts, high-powered computers and state-of-the-art trading strategies. Their continuous monitoring of the management of the issuing firms and their (and other matured investors') prompt analysis and rational use of the relevant information in forming trading strategies would reduce information asymmetry. In addition, their attempt to profit from any dependence in successive price changes would reduce the dependency in the price changes. Also, as expected, experienced investors would buy a stock when they identify that the stock is underpriced and sell a stock when they identify that the stock is overpriced. These actions would help to prevent further declines of the underpriced stock and further increases of the overpriced stock, and thus would help to reduce volatility when their actions are correct. Recently, faster, cheaper information and quicker, cheaper execution have lead to an increase in the number of day traders. Successful day traders' speculative trading activities also tend to make price changes more random and less volatile. It is reasonable to expect that experienced investors would take more right actions than wrong ones and that a greater volume of experienced trading activities would have an observable impact on stock market behavior. Figure 1 presents the declining trend of autocorrelation for the period from 1965 to 1999.

Table 2. Estimation Results

This table presents the estimated effect of investors' experience, measured by block transaction (*lnblktrans*) on autocorrelation, and the connection between rate of return, trading volume and autocorrelation.

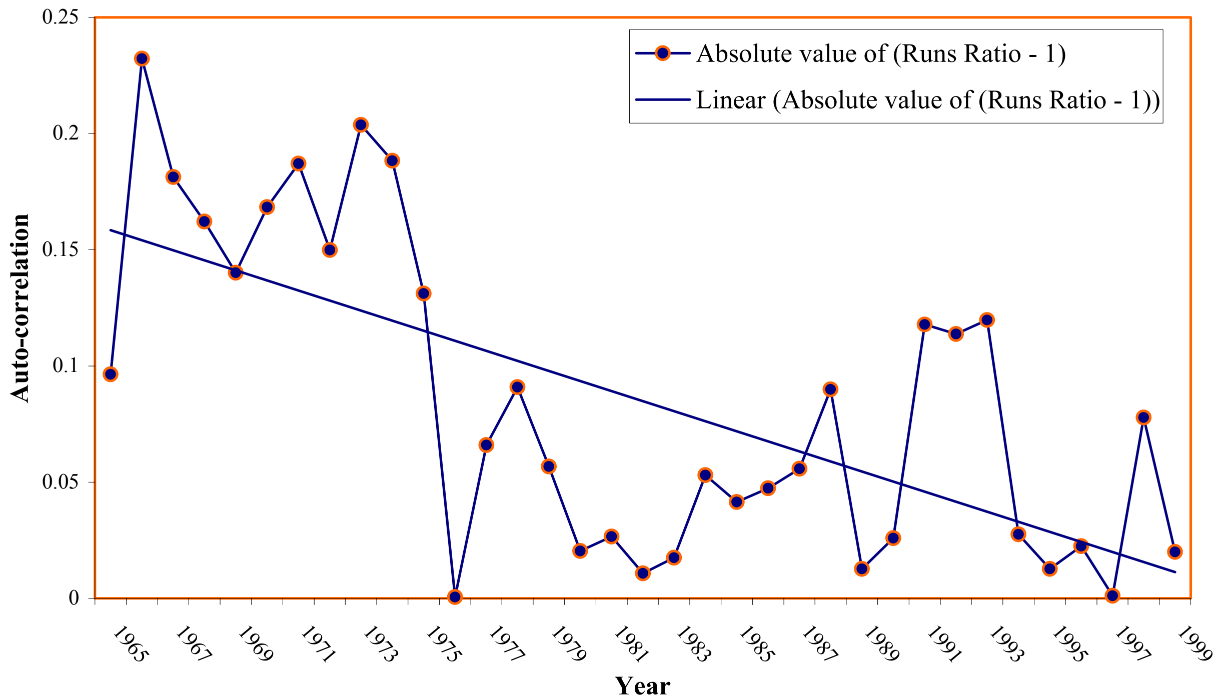
Dependent		**Independent Variables**			
Variable	**intercept**	***lnblktrans***	***return***	***lnvolume***	Adj. r^2
abs. value of (RR - 1)	0.1435 (0.954)	-0.0520 (-2.428)**	-33.3296 (-2.162)**	0.0558 (1.6230)	0.492

t-value in parenthesis.

** significant at 0.05 level

Rate of return is significantly negatively related to autocorrelation for this data set. The negative relation may occur particularly when autocorrelation is negatively connected to the level of risk and investors' risk aversion. LeBaron (1992) finds that first-order autocorrelations are larger during periods of lower volatility and smaller during periods of higher volatility for both daily and weekly returns, also, that the relation between volatility and autocorrelation may not be linear. Sentana and Wadhwani (1992) report: “when volatility is low, stock returns at short horizons exhibit positive autocorrelation, but when volatility is rather high, returns exhibit negative auto-correlation." Further tests are needed to reveal the

Figure 1. Estimated Autocorrelation in the Dow



relation between autocorrelation and rate of return.

The insignificant positive relation between volume and autocorrelation shown in this study is inconsistent with what Campbell, Grossman and Wang (1993) have found, but the nonlinearity of the relationship is consistent with what they have found. Such a positive relation could occur under two conditions. First, when professional investors and their clients/advisees take similar actions (in the same direction, such as buy or sell a stock) with short time (daily) lags, then their trading actions would be in streams and increase volume. Since these streams are in the same direction, positive autocorrelation would result. Second, when professional investors and their clients/advisees take actions in the same direction (buy or sell with market orders) with little or no time lag, then there would be overreaction in the market. These overreactions and their corrections would result in high volume and negative autocorrelation. As explained earlier, the absolute value of the estimated autocorrelation is used to reveal the effect of the independent variable, which can indicate that high volume is related to both large positive and large negative autocorrelations under the two conditions.

IV. CONCLUSION

Increasing professional trading activities has had a negative impact on autocorrelation or a positive impact on market efficiency. Autocorrelation between daily returns of the Dow is significant for less than half of the 34 years and autocorrelation fluctuates less frequently than random walk would indicate, but the fluctuation became random recently. In addition, autocorrelation and high trading volume could be positively related under certain conditions and the relation is nonlinear.

Further research is required to reveal how investors' experience and their trading behavior affect market behavior. Data representing advances in investors' experience needs to be explored because block transaction volume can serve only as an approximation for increased experience.

It must be emphasized that the relation between investors' experience and autocorrelation revealed by this study might only indicate one aspect of a historical trend. For example, when financial advisers give the same recommendation to their clients during a short period of time, or professional investors and their clients/advisees take similar actions (in the same direction, such as buy or sell a stock) with short time (daily) lags, the trading actions would be in streams. These streams would result in streams of price changes or positive autocorrelation. Many other factors also affect autocorrelation and volatility. Further tests are required to determine the potential causes for the changes in autocorrelation revealed.

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ENDNOTES

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3. Joseph Eisenhauer
4. Michael Hammerslag
5. Barbara Howard
6. Thomas Kopp
7. Michael McAvoy (2)
8. Philip Pfaf
9. John Piccione
10. Thomas Sadler

NEW YORK STATE ECONOMICS ASSOCIATION (NYSEA)
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FINAL PROGRAM

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Saturday, October 13

8:15-9:00 AM	**Convention Registration & Continental Breakfast** Canisius Center at Amherst

9:00 – 10:30 am
Concurrent sessions
(session codes A, B, C, D, E correspond to room assignments)

1-A) Economic Education I: Pedagogy
Chair: Richard Skolnik (SUNY Oswego)

David Culp (Slippery Rock University)
"Teaching Economic Theory in a Distributed Education Course"
Discussant: Philip Pfaff (Canisius College)

Philip Pfaff (Canisius College)
"The Black-Scholes Call Option Pricing Model: A Hands-on Approach"
Discussant: Richard Skolnik (SUNY Oswego)

Florence Pan Shu (SUNY Potsdam)
"St. Lawrence County Housing Demand and Supply Analysis: An Applied Microeconomics Term Project"
Discussant: Richard Deitz (Federal Reserve Bank of New York)

1–B) Labor Economics
Chair: Charles Callahan III (SUNY Brockport)

Monica Cherry (St. John Fisher College)
"Estimating the Marginal Wage for Exempt Salaried Workers: Are Workers Not Paid for Extra Hours of Work Productive, and Does the Market Recognize This?"
Discussant: Charles Callahan III (SUNY Brockport)

Thamir Salih (SUNY Fredonia)
"What Can Be Learned from Gender-Wage Differentials of the Last Five Decades?"
Discussant: Monica Cherry (St. John Fisher College)

1-C) Productivity and Inflation
Chair: David B. Yerger (Lycoming College)

David B. Yerger (Lycoming College)
"Inflation and Productivity Growth: Is There a Threshold Effect? An Analysis of U.S. and German Data"
Discussant: Doris Geide-Stevenson (Weber State University)

David W. Ring (SUNY Oneonta)
"The Cyclical Behavior of Productivity"
Discussant: Elizabeth Dunne-Schmitt (SUNY Oswego)

1-D) Production Functions: Theory and Applications
Chair: Richard Wall (Canisius College)

William P. O'Dea (SUNY Oneonta)
"Production Theory and Cost Curves in the Short Run"
Discussant: Steve Onyeiwu (Allegheny College)

Arthur S. Gow (University of New Haven)
"Microeconomic Theory of Chemical Production Processes: Application to an Isothermal Continuous Stirred Tank Reactor (CSTR)"
Discussant: Richard A. Wall (Canisius College)

Richard A. Wall (Canisius College)
"Production Functions Applied to Inner City Business Data"
Discussant: William P. O'Dea (SUNY Oneonta)

10:30 – 10:45 am
Coffee Break sponsored by McGraw-Hill Publishers

10:45 – 11:45 am
Concurrent sessions

2-A) Forensic Economics
Chair: John Piccione (Rochester Institute of Technology)

Larry Lichtenstein (Canisius College) and Mark P. Zaporowski (Canisius College)
"Calculation of Social Security Benefits in Disability and Wrongful Death Litigation"
Discussant: Lynn Smith (Clarion University)

Ronald Reiber (Canisius College)
"Period of Wealth Improvements to the Plaintiff Unaffected by Earnings Growth Rate"
Discussant: John Piccione (Rochester Institute of Technology)

2-B) Student/Faculty Collaborations
Chair: Nelson Civello (Canisius College)

Marco Falsone (SUNY Fredonia) and Mojtaba Seyedian (SUNY Fredonia)
"Determinants of Corporate Capital Structure"
Discussant: Richard Proctor (Siena College)

Alexi Harding (Ithaca College) and Elia Kacapyr (Ithaca College)
"Corruption and Privatization in Eastern Europe"
Discussant: Daniel Falkowski (Canisius College

2-C) Environmental Economics in New York State
Chair: James Booker (Alfred University)

Donald F. Vitaliano (Rensselaer Polytechnic Institute)
"Radon in New York Drinking Water: Costs and Benefits of Mitigation"
Discussant: Thomas R. Sadler (Manhattan College)

Thomas R. Sadler (Manhattan College)
“Reducing the New York State Income Tax Burden with a Revenue-Neutral Policy of Environmental Taxation”
Discussant: Donald F. Vitaliano (Rensselaer Polytechnic Institute)

2-D) Economic Development I: Culture and Economy in Africa
Chair: Alfred Lubell (SUNY Oneonta)

Margarita M. Rose (King’s College)
“Assessing Microlending in South Africa”
Discussant: Alfred Lubell (SUNY Oneonta)

Steve Onyeiwu (Allegheny College), Raluca Iorgulescu (RPI), and John Gowdy (RPI)
“Understanding Altruism in a Small African Village”
Discussant: Amar K. Parai (SUNY Fredonia)

2-E) Exchange Rates and Economic Policy
Chair: George Neimanis (Niagara University)

Kieron Toner (Anglia Polytechnic University)
“Structural Incompatibilites and Exchange Rate Policy: The Lesson from Australia”
Discussant: David Yerger (Lycoming College)

Ross E. Catterall (Anglia Polytechnic University)
“Speculative Currency Markets and the Stability of the Euro”
Discussant: Thamir Salih (SUNY Fredonia)

12:00 – 1:30 pm
Lunch in the Atrium
Keynote Speaker: Thomas I. Palley, Department of Public Policy, AFL-CIO
“The Economic Case for International Labor Standards”

1:45 – 2:45 pm
Concurrent sessions

3-A) Econometric Methods in International Finance
Chair: Elia Kacapyr (Ithaca College)

Elena Goldman (Rutgers University) and Hiroki Tsurumi (Rutgers University)
“Markov Chain Sampling in Doubly-Truncated Regression Model with ARMA or ARMA-GARCH Error”
Discussant: Elia Kacapyr (Ithaca College)

Kalamogo Coulibaly (American University)
“Do Countries with Well-Functioning Financial Markets Enjoy Better Credit Ratings? Evidence from a Cross-Country Analysis”
Discussant: Mojtaba Seyedian (SUNY Fredonia)

3-B) Finance in the European Union
Chair: Douglas Koritz (Buffalo State College)

Thomas J. Kopp (Siena College)
“Changes in the Comovements of the Components of European Equity Markets”
Discussant: Wojtek Sikorzewski (Universite de Caen)

Daniel Falkowski (Canisius College)
"The Euro: A Real Success or a Miserable Failure?"
Discussant: Douglas Koritz (Buffalo State College)

3-C) Regional Economies of New York State
Chair: Kent Klitgaard (Wells College)

Jason Bram (Federal Reserve Bank, New York) and James Orr (Federal Reserve Bank, NY)
"Diversity of Economic Performance in Metropolitan Areas of New York"
Discussant: Larry Lichtenstein (Canisius College)

Kent Klitgaard (Wells College)
"A Geospatial Economic Analysis of Income and Its Distribution in the Cayuga Basin"
Discussant: Craig Rogers (Canisius College)

3-D) Public Economics
Chair: Charles F. O'Donnell (Iona College)

Charles F. O'Donnell (Iona College)
"Moynihan's Proposal for Social Security Reform"
Discussant: Wade Thomas (SUNY Oneonta)

Richard Proctor (Siena College)
"The Role of Leader and Policy Board Characteristics in the Implementation of Private Sector Innovations in Local Government"
Discussant: George Palumbo (Canisius College)

3:00 – 4:30 pm
Concurrent sessions

4-A) Causes and Consequences of Macroeconomic Uncertainty
Chair: Richard Deitz (Federal Reserve Bank of New York)

Richard Skolnik (SUNY Oswego)
"Macroeconomic Implications of Operating Return Trends"
Discussant: Li Li (Pace University)

Dennis Petruska (Youngstown State University)
"Assessing Uncertainty and Federal Reserve Behavior"
Discussant: Charles F. O'Donnell (Iona College)

Li Li (Pace University)
"Responses of the Financial Market to Macroeconomic Announcements"
Discussant: Dennis Petruska (Youngstown State University)

4-B) Economic Education II: Student Success
Chair: Marianne Lowery (Erie Community College)

Charles Callahan, III (SUNY Brockport)
"The Determinants of Success in a Managerial Economics Course Revisited"
Discussant: F. Scott Wilson (Canisius College)

Dal Didia (Jackson State University)
"The Role of Exogenous Variables in Student Performance and Retention"
Discussant: Mark P. Zaporowski (Canisius College)

William P. O'Dea (SUNY Oneonta) and David W. Ring (SUNY Oneonta)
"Student Performance in Intermediate Economic Theory Courses: Does Diligence Matter?"
Discussant: Dal Didia (Jackson State University)

4-C) Economic Development II: Climate, Technology, and Trade
Chair: Alan Duchan (Canisius College)

Miriam Khawar (Elmira College)
"On Being Tropical—An Inquiry into the Linkages Between Climate and Economic Development"
Discussant: Margarita Rose (King's College)

Tarek H. Selim (George Washington University)
"A Simple Inquiry into the Economic Effects of Information Technology on International Development and Globalization"
Discussant: Florence Pan Shu (SUNY Potsdam)

Mehrdad Madresehee (Lycoming College)
"Globalization: Major Challenges Facing the Islamic Republic of Iran"
Discussant: J. Dennis Chasse (SUNY Brockport)

4-D) Economic Thought: Past and Present
Chair: Doris Geide-Stevenson (Weber State University)

William T.Ganley (Buffalo State College)
"The Historical Influences of Biology on the Development of Economic Methodology"
Discussant: Kent Klitgaard (Wells College)

Robert S. D'Intino (Penn State University) and John A. Sinisi (Penn State University)
"The Evolution of Cooperative Behavior from *Leviathan* to *The Wealth of Nations*"
Discussant: William T. Ganley (Buffalo State College)

Dan Fuller (Weber State University) and Doris Geide-Stevenson (Weber State University)
"Consensus Among Economists Revisited"
Discussant: Robert S. D'Intino (Penn State University)

4-E) Economic History
Chair: David Culp (Slippery Rock University)

Wojtek Sikorzewski (Universite de Caen)
"Corners on the Commodity Futures Markets in the 19^{th} Century"
Discussant: Ranjit S. Dighe (SUNY Oswego)

Michael McAvoy (SUNY Oneonta)
"Domestic Exchange Rates Prior to the Founding of the Federal Reserve System"
Discussant: David Culp (Slippery Rock University)

Ranjit S. Dighe (SUNY Oswego) and Elizabeth Dunne-Schmitt (SUNY Oswego)
"Did Wages Become Stickier Between the World Wars?"
Discussant: Jason Bram (Federal Reserve Bank of New York)

4:45 – 6:00 pm
Annual Business Meeting; open to all NYSEA members

PRESENTERS, DISCUSSANTS, AND CHAIRS

Name	Session(s)
Booker, James	2C
Bram, Jason	3C, 4E
Callahan, Charles III	1B, 4B
Catterall, Ross E.	2E
Chasse, J. Dennis	4C
Cherry, Monica	1B
Civello, Nelson	2B
Coulibaly, Kalamogo	3A
Culp, David	1A, 4E
D'Intino, Robert	4D
Deitz, Richard	1A, 4A
Didia, Dal	4B
Dighe, Ranjit S.	4E
Duchan, Alan	4C
Dunne-Schmitt, Elizabeth	1C, 4E
Falkowski, Daniel	2B, 3B
Falsone, Marco	2B
Ganley, William	4D
Geide-Stevenson, Doris	1C, 4D
Goldman, Elena	3A
Gow, Arthur S.	1D
Harding, Alexi	2B
Kacapyr, Elia	2B, 3A
Khawar, Miriam	4C
Klitgaard, Kent	3C, 4D
Kopp, Thomas	3B
Koritz, Douglas	3B
Li, Li	4A
Lichtenstein, Larry	2A, 3C
Lowery, Marianne	4B
Lubell, Alfred	2D
Madresehee, Mehrdad	4C
McAvoy, Michael	4E
Neimanis, George J.	2E
O'Dea, William P.	1D, 4B
O'Donnell, Charles	3D, 4A
Onyeiwu, Steve	1D, 2D
Palumbo, George	3D
Parai, Amar K.	2D
Petruska, Dennis	4A
Pfaff, Philip	1A
Piccione, John	2A
Proctor, Richard	2B, 3D
Reiber, Ronald	2A
Ring, David W.	1C, 4B
Rogers, Craig	3C
Rose, Margarita	2D, 4C
Sadler, Thomas	2C
Salih, Thamir	1B, 2E
Selim, Tarek	4C
Seyedian, Mojtaba	2B, 3A
Shu, Florence P.	1A, 4C
Sikorzewski, Wojtek	3B, 4E
Skolnik, Richard	1A, 4A
Smith, Lynn	2A
Thomas, Wade L.	3D
Toner, Kieron	2E
Vitaliano, Donald	2C
Wall, Richard A.	1D
Wilson, F. Scott	4B
Yerger, David	1C, 2E
Zaporowski, Mark P.	2A, 4B