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JOURNAL OF ECONOMICS AND ECONOMIC EDUCATION RESEARCH

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LETTER FROM THE EDITOR

We are extremely pleased to present this issue of the *Journal of Economics and Economic Education Research*, an official publication of the Academy of Economics and Economic Education Research, dedicated to the study, research and dissemination of information pertinent to the improvement of methodologies and effective teaching in the discipline of economics with a special emphasis on the process of economic education. This journal attempts to bridge the gap between the theoretical discipline of economics and the applied excellence relative to the teaching arts. The Academy is an affiliate of the Allied Academies, Inc., a non profit association of scholars whose purpose is to encourage and support the advancement and exchange of knowledge, understanding and teaching throughout the world.

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JoAnn and Jim Carland

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THE IMPACT OF GAS PRICE TRENDS ON VEHICLE TYPE CHOICE

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ABSTRACT

When shopping for cars, customers consider several factors, including comfort, safety, and cost. Due to recent fluctuations in gas prices, fuel economy has become increasingly critical among these factors. As a result, the auto industry is experiencing new demand patterns among their vehicle inventory: demand for high-consumption vehicles (i.e. SUVs) is down, and demand for gas-efficient cars (i.e. hybrids) is up.

Quantifying the impact of gas prices on vehicle choice is the subject of many studies in the literature. Those studies have typically investigated the short-term effects of gas price changes on customer behavior. This article addresses the impact of fuel cost fluctuations on customers' vehicle choice, a long-term decision, through the analysis of U.S. automobile sales data from 1990 to 2007.

KEYWORDS: Transportation Economics, Traveler Behavior, Gas Price, Demand Elasticity.

INTRODUCTION

The cost of energy is an important factor for all sectors of the economy — government, private sectors, and consumers. The recent fluctuations in energy cost have altered the decisions and behavior of many groups. Among all sectors, transportation accounts for nearly 67 percent of all petroleum consumption in the United States. From 1977-2002, the transportation sector's petroleum usage grew by 35 percent, but overall national petroleum use only increased by 7 percent (EIA, 2007). This indicates that overall non-transportation petroleum usage declined during this period while transportation usage more than doubled the net national increase. Additionally, transportation distillate use (highway, rail, and marine) constituted the fastest-growing element of national petroleum use. American passenger-miles have more than quadrupled since 1950, far exceeding the population growth rate.

Since transportation costs are dependent on fuel prices, the auto industry needs to study customer responses to fuel cost increases. Modeling customer choice and providing the vehicles consumers prefer helps the auto industry to improve their market share, and makes the economy less susceptible to the global oil market shocks. This in turn allows the economy to reduce the oil dependency and respond to fuel shortages more efficiently.

Two major oil price increases have occurred in the U.S. history: in the 1970s, and since 2004. After the first increase, people altered their shopping and recreational trips, but avoided altering their automobile trips to work. After oil prices dropped in the 1980s, household vehicle trips increased, primarily for non-work trips (Loeta, 2007).

While there are many studies about the long-term and short-term effects of oil price increase of the 1970s, few studies have been performed about recent fuel price fluctuations.

Haire and Machemehl (2006) analyzed five cities in the United States and found that most transit systems have experienced a ridership growth of approximately 0.09 percent for each additional cent of fuel price. In a 2005 survey of 500 residents of Austin, Texas, Bomberg and Kockelman (2007) found that travelers reduce their overall driving and/or chain their trips together to cope with high gas prices. They also reported that households drove their most fuel-efficient vehicles more when gasoline prices increased in 2005.

Goodwin et al. (2004) reviewed empirical studies since 1990 and found that a 10 percent increase in the real price of fuel produces:

a 1.0 percent reduction in vehicle miles traveled;
a 2.5 percent reduction in fuel consumption;
a 1.5 percent increase in the fuel efficiency of vehicles; and
a less than 1.0 percent decrease in net vehicle ownership.

Eltony (1993) attempted to model gasoline demand for Canada. He demonstrated through regression models that in response to a gas price increase, households planning to buy a new car either postpone their vehicle purchases or buy a more fuel-efficient car, and households that already own a car drive fewer miles.

Wadud et al. (2008) used a large household-level panel dataset to investigate the demand for gasoline in the United States. They concluded that the price and income elasticities of different households depend on income and other demographic and location characteristics. Income elasticity decreases as income increases, suggesting that multiple-car households consume more fuel as income increases than those with only one car. Also, multiple-wage-earner households drive more when their income increases than zero or single-wage-earner households. In response to an increase in income, there are not significant behavior differences between rural and urban households. They also concluded that multiple-vehicle households are more price elastic. This could be due to their ability to switch to a more fuel-efficient vehicle when gas prices increase. Multiple- wage-earner households have higher price elasticities than single-wage-earners, possibly because these households have higher flexibility in rearranging their travel patterns.

The demand for automobile transportation is determined jointly as the product of the decision of how many cars to own and how many miles to drive each car. The most important determinant of driving demand is income and its effect through automobile ownership rather

than the number of miles driven. The elasticity of miles driven with respect to income, holding the number of cars constant, is less than 0.1, while the elasticity of automobile ownership with respect to income is 0.8. Many studies have concluded that in contrast to the responsiveness of automobile demand to income, the elasticity of auto driving to the cost of driving is very low. Drivers seem to adjust to higher gasoline prices not by driving less but by switching to more fuel-efficient automobiles. Therefore, while the elasticity of demand for gasoline to the gasoline price is significantly different from zero, the responsiveness of the number of miles driven to the gas price changes is close to zero (Boyer, 1997).

Consumers react differently to gas price increases in short-term than long-term. In short-term, they try to reduce the gas expenses by adjusting their daily behavior. They can use their fuel-efficient cars in the case of having multiple vehicles, use cheaper gas types, combine their trips, and reduce unnecessary trips. In long-term, however, they can change their transportation mode, their destinations, and finally their non-fuel-efficient vehicles.

This study investigates whether customers have changed their automobile-purchase behavior due to gas price increases since 2004. Using a model similar to the one described in Eltony's 1993 study, this study examines whether people have started to buy more fuel-efficient cars.

THE EMPIRICAL MODEL

A customer's binary choice between two types of vehicles is made based on household characteristics and the car features. Let the ratio of the probability of choosing car type z to type x by household i be Piz/Pix. K_i represents household characteristics, and L_t denotes characteristics of the alternative car type t.

$$P_{iz}/P_{ix} = (e^{A_z + B_z K_i + CL_z}) / (e^{A_x + B_x K_i + CL_x}) \quad (1)$$

Where:
P_{iz}/P_{ix} = The ratio of the probability y of choosing car type z to car type x by household i
K_i = Characteristics of household i
L_t = Characteristics of car type t, (t= z, x)
A_t, B_t, C = Coefficients

Taking the logarithmic of the above equation yields

$$Ln(P_{iz}/P_{ix}) = (A_z - A_x) + (B_z - B_x)K_i + C(L_z - L_x) \quad \text{for } z = 1\text{-}5,\ z \# x \quad (2)$$

Since the data on the household choice of the type of new car is unavailable, we substitute the probabilities by the relative frequencies of the households with the attributes Ki, choosing car type z as follows:

$$Ln(N_z/N_x) = (A_z - A_x) + (B_z - B_x)K + C(L_z - L_x) \quad \text{for } z = 1\text{-}5,\ z \# x \qquad (3)$$

Household disposable income and unemployment rate are the household characteristics (K) used in our estimation. The car characteristics (L) used in our estimation are the difference in car prices and the gasoline cost per mile for the current and two preceding years. In order to be able to use logit estimation (similar to the model used in Amemia, 1981), we assume that the coefficient of vehicle characteristics, L, are equal. Therefore, equation (3) can be rewritten as equation (4).

$$Ln(N_z/N_x) = A + B_1 .Income + B_2 .Un + C_1 .(P_{nz} - P_{nx}) + C_2 .P_g(1/en_z - 1/en_x) + C_3 .P_{g-1}(1/en_z - 1/en_x) + C_4 .P_{g-2}(1/en_z - 1/en_x)$$
$$\text{for } z = 1\text{-}5,\ z \# x \qquad (4)$$

Where:
$A = A_z - A_x$
$B_1 = B_{1z} - B_{1x}$
$B_2 = B_{2z} - B_{2x}$
C_1 , C_2 , C_3 , C_4=Components of coefficient array C
Income = Household disposable income
Un = Unemployment rate
$P_{nz} - P_{nx}$= The difference in car type average prices
P_g = Price of gasoline per gallon
P_{g-1} = Price of gasoline per gallon one period back
P_{g-2} = Price of gasoline per gallon two periods back
en = Technical fuel economy in mile per galon

DATA AND EMPIRICAL APPROACH

We acquired the time series data from 1990-2007 for the United States from several sources. The population, unemployment rate, and the average household income were derived from the U.S. census. The average gas price, fuel efficiencies, and percentage of cars sold in each car type were obtained from the U.S. Department of Energy (Table1).

The U.S. population increased from 248,709,873 in 1990 to 303,162,947 in 2007. A larger population causes more car purchase and more trips. Average household income decreased from 1990 to 1993, and then increased from 1993 to 1999 due to the good economic situation and the Internet boom during this period.

The average income per household fluctuated from 1999 to 2002. The average income per household then increased from 2002 to 2007, following the economic pattern in the United States. The unemployment rate is the inverse of the income pattern: increasing from 1990 to

1992, decreasing from 1992 to 2000, increasing from 2000 to 2003, and decreasing again from 2003 to 2007.

The Environmental Protection Agency's (EPA) fuel economy standards have five different categories for passenger cars. Car Type 1 has a fuel efficiency of 5-20 miles per gallon, representing pickup trucks, SUVs, vans, and some large sedans. Car Type 2, which accounts for small SUVS and some large sedans, has a fuel efficiency of 20-25 miles per gallon. Car Type 3 has a fuel efficiency of 25-30 miles per gallon. This vehicle category includes mid-size cars. Car Types 4 has a fuel efficiency of 30-35 miles per gallon and represents small cars. Car Type 5 that represents hybrid cars has a fuel efficiency of 35-55 miles per gallon.

We utilized a linear regression, equation (4), for the car sales ratios of all car types (aggregate) relative to Car Type 1 (Van/SUV/Large Sedan). We then performed similar linear regression for each separate car type category.

Before performing regression analysis, we tested the co-linearity between income and unemployment rate. The co-linearity is -0.59, therefore, we use only one of the two variables. We assumed that number of cars sold in each car type compare to car type 1 (Van/SUV/Large) is a function of income or unemployment, the difference of price of the car from Van/SUV/Large, and the gasoline cost per mile of the car compare to Van/SUV/Large.

Table 1
The National Socio-economic Data from 1990 to 2007

Year	Population	Income	Unemp	GasPrice	Van/SUV/Large	SmallSUV	Medium	Small	Hybrid
1990	248,709,873	38446	5.6	1.299	13.6	51.1	28.9	5.3	1.2
1991	252,153,092	37314	6.8	1.098	14.7	50.4	27.3	5.9	1.7
1992	255,029,699	36965	7.5	1.087	12	57.5	22.8	5.1	2.6
1993	257,782,608	36746	6.9	1.067	13.2	53.4	25.5	5.5	2.4
1994	260,327,021	37136	6.1	1.072	16.2	52.1	24.6	4.9	2.2
1995	262,803,276	38262	5.6	1.103	13.5	52.6	25.8	7.1	0.9
1996	265,228,572	38798	5.4	1.192	10.5	62.2	21.5	5.1	0.7
1997	267,783,607	39594	4.9	1.189	11	59.7	25.2	3.7	0.4
1998	270,248,003	41032	4.5	1.017	10	59.4	26.8	3.4	0.4
1999	272,690,813	42187	4.2	1.116	10	65.6	22.6	1.6	0.2
2000	281,421,906	42148	4	1.462	9.2	69.8	19	1.6	0.5
2001	285,226,284	42900	4.7	1.384	11.8	60.7	19.9	7	0.4
2002	288,125,973	42409	5.8	1.313	10.2	65.8	17.5	5.9	0.6
2003	290,796,023	43318	6	1.516	10.8	60.1	24.1	4.1	0.8
2004	293,638,158	44389	5.5	1.812	13.2	56.3	27.2	2.2	1.1
2005	296,507,061	47845	5.1	2.240	13.7	47.7	30.3	6.4	1.9
2006	299,398,484	48201	4.8	2.533	14.7	49.8	25.1	8.9	1.5
2007	303,162,947	48557	4.6	2.700	16	46.8	29.3	5.7	2.3

GAS PRICES AND CAR SALES: A FIRST LOOK

Figure 1 charts the trend in gas prices in the U.S. Gas price fluctuated from 1990 to 1999 but remained below $1.20 per gallon. From 2000-2003, it was less than $1.50 per gallon. Gas prices began to rise in 2004, and reached an average price of $2.70 per gallon in 2007.

The retrieved data on the percentages of cars sold in the U.S. in each category suggests that people buy more fuel-efficient cars when gas prices increase (Figure 2). The percentage sold of Car Type 1 (pickup trucks, SUVs, vans, and some large sedans) with fuel efficiency of 5-20 miles per gallon, fluctuates from 1990 to 2007, with a minimum of 9.2 percent in 2000 and maximum of 16.2 percent in 1994.

Car Type 2 (small SUVs and some large sedans) has a fuel efficiency of 20-25 miles per gallon. While it is the bestseller of all car types — ranging from 46.8 percent of all cars sold in 2007 to 69.8 percent in 2000 — sales dramatically decreased after 2005. That drop in sales coincides with the rise in gas prices (Figure 2).

Car Type 3 (mid-size cars) with a fuel efficiency of 25-30 miles per gallon, made up 28.9 percent of cars sold in 1990. That number fell to 17.5 percent in 2002, with smaller subsequent fluctuations.

Until 2000, Car Types 4 (small cars) and 5 (hybrids) represented a very small share of total car sales. However, by 2007, Car Type 5 sales were ten times bigger than they were seven years earlier. Figure 3 shows that hybrid cars have the same trend as gas price.

Figure 1
Gas price (Dollar per Gallon) Trend in the U.S. from 1990 to 2007

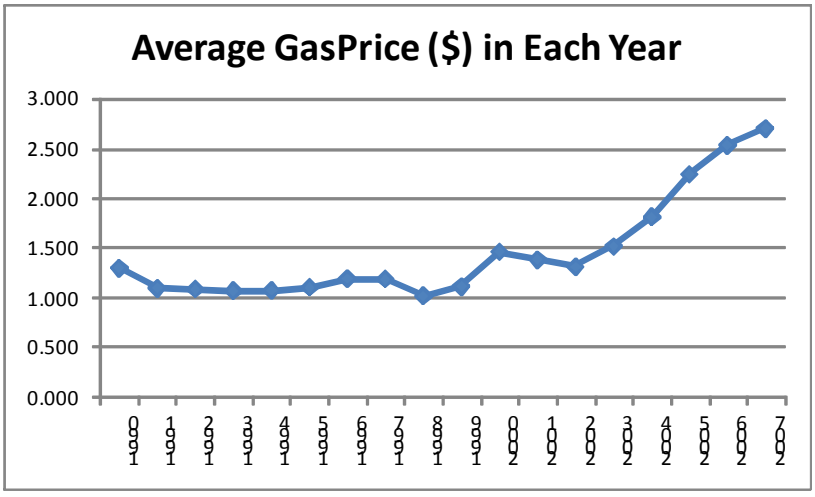


Figure 2
Percentage Car Sale Trend in the U.S. from 1990 to 2007

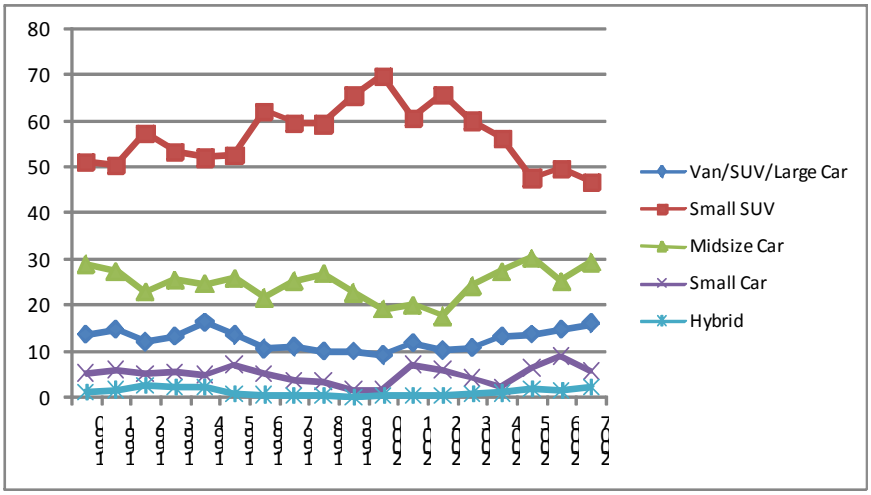
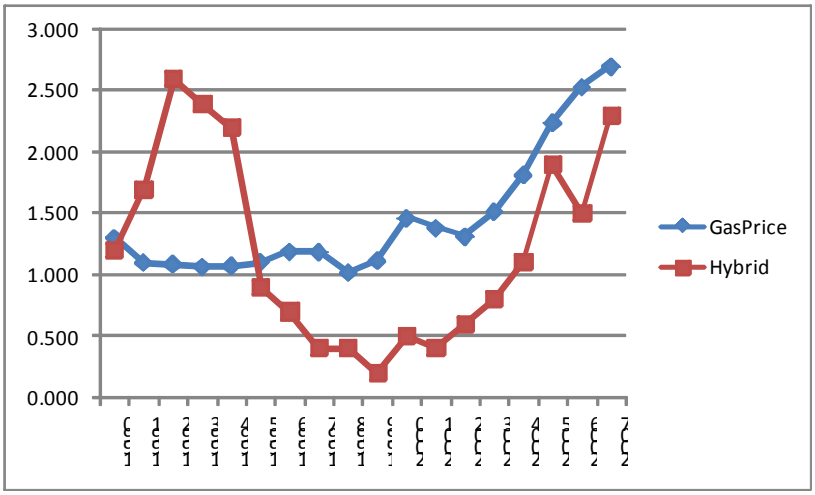


Figure 3
Hybrid Car Sale Trend Percentage versus Gas Price ($) in the U.S. from 1990 to 2007



EMPIRICAL RESULTS

The regression estimation results of all car types (aggregate) relative to Car Type 1 (Van/SUV/Large Sedan) are presented in Table 2. The results indicate that people begin purchasing more fuel- efficient cars when gas prices have increased for two periods.

There is a negative relationship between the difference in car type average prices and number of other cars sold compare to Van/SUV/Large Sedans. In another words, when the price of other cars increases, people buy more of Van/SUV/ Large Sedan. This by itself explains 70%

of the model (R^2=.70 when the dependent variable is only the price difference) and is the most important factor in people's car purchase behavior. People also buy more fuel- efficient cars when the unemployment rate increases. The coefficient of this variable is rejected to be zero in 90% confidence interval. Also, when population increases, people buy more of other cars compared to Van/SUV/Large sedans. When gas price increases, the difference in gasoline cost per mile increases. Therefore, people buy more of other cars compare to Car Type 1 (Van/SUV/Large Sedans), which has the lowest efficiency. The effect of gas price goes back to two years, meaning that when gas price keeps increasing for two years, people will start buying more fuel efficient cars. The difference in gas cost per mile in two years back explains around 42% of the model. We checked the effect of gas price in three or more years back, but it did not explain the model better and it decreased R^2.

We also performed a similar regression analysis for each car type to Car Type 1 (Van/SUV/Large Sedans) separately. The results, presented in Table 3, verify that, people tend to buy smaller cars when employment rate decreases. The results also verify the previous conclusion that people buy smaller cars when gas prices increase, after two years. However, most of the coefficients are not significant, and the adjusted R2 is very low due to having few data points and many variables for each car type.

From Plunkett Research, we acquired data on the percentages of only new cars sold in each category in the U.S. from 2000 to 2005. Plunkett Research has a different category for cars. It separates vans, SUVs, and large sedans. Also it does not have a category for hybrid cars. Category 1 is small cars with fuel efficiency of 33.7 miles per gallon (mpg). Category 2 represents mid-size sedan with fuel efficiency of 26.8 mpg. Category 3, large sedan, has a fuel efficiency of 18.7 mpg. Category 4 represents SUVs with fuel efficiency of 16.6 mpg and category 5, van, has a fuel efficiency of 15 mpg.

We performed a similar regression model for the new car sales ratios of each car type relative to category 1 (small cars). Table 4 presents the results. R2 and adjusted R2 are low due to few data points. However, all the coefficients are different from zero and the results verify the results acquired from previous model.

The coefficient of the difference in car type average prices is negative and it is rejected to be zero with 95% confidence interval. It means that, when the price of other cars increases compare to small cars, people buy less of other cars compare to small cars. The coefficient of income is positive and it is rejected to be zero with 90% confidence interval, meaning that when income increases, people buy more of larger cars. The coefficient of the difference in gasoline cost per mile is negative and is rejected to be zero with 95% confidence interval. In other words, when gas price increases, people buy more of small cars. However, adding the difference in gasoline cost per miles for previous years decreased R2 and the hypothesis that the coefficients are zero, could not be rejected. Therefore, we did not include them in the regression.

Table 2
Car Sales Ratios to Car Type1 (Van/SUV/Large Sedans)

Variables	Coefficient	T-Stat	P-Value
The difference in car type average prices	-.377	-6.46	0.000
Unemployment	0.236	2.43	0.018
The difference in gasoline cost per mile in the same year ($P_g(1/en_z - 1/en_x)$)	4.627	0.20	0.839
The difference in gasoline cost per mile in one year earlier ($P_{g-1}(1/en_z - 1/en_x)$)	-16.939	-0.50	0.617
The difference in gasoline cost per mile in two year back ($P_{g-2}(1/en_z - 1/en_x)$)	47.493	1.71	0.092
Population	0.184	1.75	0.085
Constant	-2.96	-0.95	0.348
R^2	0.76		
Adjusted R^2	0.74		

Table 3
Car Sale Ratios by Car Type to Car Type1 (Van/SUV/Large Sedans)

Variables/Car Type	Small SUV	Midsize Small	Hybrid
$P_{nz} - P_{nx}$	--	--	--
Unemployment	0.103 (3.88)	-0.068.576)	.173 (1.381)	0.529 (5.658)
$P_g(1/en_z - 1/en_x)$	18.349 (1.089)	-6.840 (-0.81)	25.387 (1.250)	-37.016 (-3.038)
$P_{g-1}(1/en_z - 1/en_x)$	36.262 (1.41)	18.296 (1.485)	-28.669 (-1.965)	11.818 (0.669)
$P_{g-2}(1/en_z - 1/en_x)$	-18.559 (-0.829)	-10.504 (-0.967)	27.166 (1.031)	-4.301 (-0.270)
Population	0.130 (2.563)	-0.150 (-0.401)	0.011 (0.101)	-0.158 (-1.937)
Constant	-0.595 (-0.433)	1.511 (1.486)	-2.512 (-0.851)	-2.718 (-1.233)
R^2	0.72	0.31	0.37	0.85
Adj. R^2	0.60	0.02	0.11	0.79

Table 4
Car Sale Ratios for the New Cars

Variables	Coefficient	T-Stat	P-Value
$P_g(1/en_z - 1/en_x)$	-0.334	-5.08	0.000
$P_{nz} - P_{nx}$	-0.176	-4.70	0.000
Unemployment	-0.125	-2.69	0.014
Constant	-5.632	-2.81	0.011
R^2	0.58		
Adjusted R^2	0.51		

We also calculated the elasticities of car sale ratio of each car type to car type 1 (Van/SUV/Large sedans) to gas price using the above data. We found that if gas price increases by 10%, the ratio of small SUV's to Van/SUV/Large sedan's sale decreases by 13.7%. This ratio increases by 1.5% for mid size car, increases by 2.8% for small cars, and increases by 9.1% for hybrid cars.

CONCLUSION

Gas price has a direct impact on vehicle choice customers. Customers tend to purchase more fuel efficient vehicles as the gas price gets higher. However, this impact is not immediate and there is a time lag between price changes and vehicle choice. Regression modeling shows that an up tick in the purchase of fuel-efficient vehicles starts about two years after significant increases in gas price. Our results also indicates that a 10% increase in gas price, decreases the SUV demand by 13.7% and increases the demand for Hybrid cars by 9.1%.

Several studies had concluded that households with several cars would switch to more fuel efficient cars when gas price increases. Some other studies indicated that people would not reduce their trips but they would switch to more fuel efficient cars when gas price increases. Our study verifies their finding.

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THE EFFECTS OF ALCOHOL USE ON SCHOOL ENROLLMENT

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ABSTRACT

Considerable controversy surrounds the effects youth alcohol use has on educational outcomes. This article addresses the question of whether youth drinking leads, in causal ways, to lower school enrollment, or is the widely reported negative correlation between drinking and this educational outcome caused by common unobservable factors? An instrumental variable model is estimated to study the effects of several drinking measures on the probability school enrollment for a sample of high school and college age individuals. Extensive testing is conducted to verify instrument strength and exogeneity. Results indicate that alcohol use reduces school enrollment among those of high school and college age and results are consistent across instrument specifications.

INTRODUCTION

In many health-related and social science fields, there has been considerable concern about the various harmful effects of alcohol use. Recent evidence indicates drinking, coupled with smoking, reduces income (Auld 2005). Another related consequence of alcohol use is the potential reduction in human capital accumulation by drinkers. This issue is particularly acute during adolescence and early adulthood, in which decisions regarding high school completion and college attendance are first considered, and academic performance realizations that affect longer-term educational and economic outcomes are initially observed. Excessive drinking has been associated with this age group despite its illegality until the age of 21. For instance, data from the 2006 and 2007 National Survey on Drug Use and Health (NSDUH) found approximately 18 percent of youths ages 15 – 18 (high school age) and approximately 43 percent of young adults ages 18 – 25 (college age) engaged in binge drinking, i.e. the consumption of at least five alcoholic beverages in one sitting, in the past month.

Several reasons might lead heavy drinking to impair human capital formation. Intoxication potentially interferes with class attendance and learning, and time spent in activities where drinking occurs could substitute away from time allocated to studying. This hurts academic performance in the short term, which might diminish the ability or incentive to continue schooling over the longer term. Risks stemming from intoxication, such as injury from accidents or fights, pregnancy and disease from unsafe sex, conflicts with parents or law enforcement, and a tarnished reputation with school authorities can also limit the capability of a student to remain in school (Cook and Moore 1993). Alternatively, social interactions associated

with drinking might improve academic achievement by providing a means of relieving stress (Williams et al. 2003).

Much evidence has established a negative relationship between the regularity and intensity of drinking and human capital measures such as school completion. But distinguishing whether these relationships are causal, such that increased alcohol consumption directly reduces, for example, probable school enrollment, or merely correlational, with changes in other confounding variables simultaneously leading to drinking and lower enrollment rates, is critical.

Thus, for economists and policy makers, obtaining an accurate estimate of the magnitude of the causal effect that alcohol use has on educational outcomes should be a top priority. This task is a natural one to tackle by using econometric techniques such as instrumental variables (IV) regression – a method specifically designed to estimate the causal impact of a variable that does not otherwise vary independently with other unobserved determinants of the outcome being examined.

Why is the potential impact of alcohol use on school enrollment relevant for the discipline of economics? Human capital accumulation bears directly and heavily on earning potential and it is widely accepted that strong and statistically significant relationships link individual health and human capital formation. Moreover, variables such as school completion and enrollment are commonly examined education outcomes among broader literatures on human capital accumulation, given that they are easily measured and have a clear marginal impact on future wages that economists have long focused on estimating.

LITERATURE OVERVIEW

Only recently has the relationship between alcohol use and human capital accumulation been addressed by economists, and research on the topic had been fairly limited, with measures of drinking and schooling as well as conclusions varying across studies. Comparatively early research produces evidence of a negative relationship, but either makes no attempt to econometrically deal with the potential endogeneity of drinking in education equations, or does so in a way that has since been criticized as unsatisfactory, so it is unclear whether this negative correlation indeed represents declines in educational outcomes that are caused by drinking.

Cook and Moore (1993), estimate IV models in which the effect of current alcohol use on post-secondary schooling was identified by the state excise tax on beer and an indicator for whether the student could legally drink based on the state's MLDA. Results from three separate specifications show that heavy drinking in 12^{th} grade decreased subsequent schooling. Dee and Evans (2003) call into question the causal effect interpretation of these results. They argue that the use of cross-state alcohol policy variation to identify the effects of drinking on other outcomes is potentially problematic because such variation might be correlated with unobservable attributes that affect both alcohol use and educational attainment.

Mullahy and Sindelar (1994), use ordinary least squares (OLS) regressions, and find that the onset of alcoholism symptoms by age 22 is associated with a five percent reduction in completed schooling. Yamada et al. (1996) use single equation probit models that do not account for the possibility that alcohol use is endogenous. Results show that the probability of high school graduation is 6.5 percent lower for students who consumed alcohol on at least two occasions in the previous week. In addition, drinking is inversely related to beer taxes, liquor prices, MLDAs and marijuana decriminalization, meaning that each is positively associated with high school graduation rates through its covariance with alcohol use.

Koch and Ribar (2001) examine the relationship between age of drinking onset and educational attainment by age. Estimates from IV models that specify sibling onset age as the instrument for respondent onset age imply that delaying alcohol initiation by a year increases subsequent schooling by 0.22 years. However, they argue that this represents an upper bound for the effect size based on the sign of the bias if the assumptions needed for consistency are not met, and indeed OLS and family fixed effects models produce estimates that are three to four times smaller for males, and still smaller and sometimes insignificant for females.

More recent evidence comes from Chatterji and DeSimone (2005), who estimate the effect of binge and frequent drinking by adolescents on subsequent high school dropout using an IV model with an indicator of any past month alcohol use as the identifying instrument. In contrast to the last two studies cited above, the authors find that OLS yields conservative estimates of the causal impact of heavy drinking on dropping out, such that binge or frequent drinking among 15–16 year old students lowers the probability of having graduated or being enrolled in high school four years later by at least 11 percent. The results of overidentification tests using two measures of maternal youthful alcohol use as additional instruments provide support for their empirical strategy. Also, Oreopoulos (2006) finds that the gains from policies requiring compulsory schooling up to a certain age are quite large, regardless of whether "these laws impact on a majority or minority of those exposed."

DATA

The National Survey on Drug Use and Health (NSDUH), sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), is administered to approximately 55,000 civilian, non-institutionalized individuals age 12 and over, chosen so that the application of sample weights produces a nationally representative sample, with approximately equal numbers of respondents from the 12–17, 18–25 and 26 and over age groups. Data from the NSDUH allow for both breadth and depth of coverage on the topic. Breadth comes from the ability to study aspects of educational outcomes using data from an elaborate questionnaire covering a wide array of youth experiences. Depth is provided by numerous variables on demographics, family income, family composition and relocation.

An equally important facet of the NSDUH data is that they are conducive for the use of the IV regression methodology to estimate the causal effect of alcohol use on human capital.

Abundant information is collected on experiences related to alcohol consumption, including measures of religiosity and the perceived risks involved in alcohol/ drug use. An assortment of variables are observed, therefore, that have the potential to serve as instruments for the proposed model, in the sense that they are very likely to be highly correlated with alcohol use but would not have any obvious reason to be otherwise associated with educational outcomes.

A potentially problematic attribute of the data is non-random measurement error emanating from the self-reported nature of responses. Although IV will eliminate bias from random measurement error, it cannot salvage data plagued by systematic measurement error. However, studies on the quality of self-reported academic variables and drinking data suggest that such reporting bias should be minimal. Cassady (2001) finds that self-reported GPA values are "remarkably similar to official records" and therefore are "highly reliable" and "sufficiently adequate for research use." Grant et al. (1988), Midanik (1988) and Reinisch et al. (1991) conclude that youth drinking self-reports are reliable, based on the consistency of responses to alcohol use questions from repeated interviews. Harrison and Hughes (1997) find that survey methods not requiring subjects to verbally answer questions, as in the NSDUH, increase the accuracy of substance use self-reports.

RESEARCH METHOD AND EMPIRICAL SPECIFICATION

In determining causation, the primary methodological question is whether drinking is properly specified as an exogenous variable with respect to educational outcomes or should instead be treated as endogenous. Consider the following equations, in which drinking (D) is a function of exogenous factors and an educational variable such as school enrollment (E) is a function of some (but not all) of the same exogenous determinants as well as D,

$$(1) \qquad D = \alpha_0 + Z\alpha_1 + X\alpha_2 + \omega,$$
$$(2) \qquad E = \beta_0 + \beta_1 D + X\beta_2 + \varepsilon.$$

In the above equations, which apply to individual NSDUH respondents (with the corresponding observation-level subscript suppressed), vectors X and Z represent sets of exogenous variables that affect both drinking and enrollment (X), and drinking but not enrollment (Z), ω and ε are error terms that encompass all factors influencing the corresponding dependent variable that are not explicitly controlled for on the right hand side of the equations, and the α's and β's are parameters to be estimated. Econometrically, alcohol use is exogenous in equation 2 if it is uncorrelated with the error term ε. This condition holds, by definition, if none of the unobserved schooling determinants are related to drinking. If so, there is no need to estimate equation 1; a single equation regression method such as OLS will produce consistent estimates of the causal effect of drinking, β_1.

However, two sources of endogeneity could possibly lead to a nonzero correlation between alcohol use (D) and the error term in (2). One is unobserved heterogeneity, which would occur if any unmeasured educational outcome (e.g. enrollment) determinants that are subsumed in the error term ε are correlated with alcohol use; the resulting estimate of β_1 in (2) would suffer from omitted variable bias, which cannot be eliminated directly because the omitted variables are not recorded in the data. Disruptive events such as parental separation or divorce might simultaneously be responsible for greater alcohol consumption and lower school enrollment rates.

Such events are not observed and thus are not held constant in the regression. The negative correlation between drinking and school enrollment that they induce becomes embedded into the alcohol use coefficient, which is thus biased negatively as an estimate of the causal drinking effect. Conversely, unmeasured ability or socioeconomic background could create a positive bias in the estimated drinking effect if higher ability individuals are better able to function normally after alcohol consumption, or students who have more money to spend on alcohol also enjoy greater academic success and are more likely to be enrolled in school.

The other potential source of endogeneity is reverse causation. If alcohol use and educational outcomes like enrollment are simultaneously determined, the outcome will not only be a function of drinking, as specified in equation 2, but also will be a contributing factor to the decision regarding whether and how much alcohol to consume. In terms of equation 2, shocks to the error term ε that, by definition, influence educational outcomes will ultimately extend to drinking through the feedback effect of educational outcomes on alcohol consumption, thus creating a correlation between alcohol use and ε that renders the estimate of the causal drinking effect β_1 inconsistent. To investigate the possibility that alcohol use is endogenous as an explanatory factor for school enrollment, this analysis utilizes the method of instrumental variables (IV).

To use IV, there must be at least one, preferably two or more, variables (i.e. instruments or IVs) that affect alcohol use but have no direct impact on enrollment. In the case of exactly one instrument Z, the IV method works by estimating the causal drinking effect β_1 as the ratio of the sample correlation between the instrument and school enrollment to the sample correlation between the instrument and alcohol use, i.e.

$$(3) \qquad \beta_1 = \text{corr}[Z, E]/ \text{corr}[Z, D],$$

where the quantity is estimated from the data and the correlations are estimated while holding constant the vector X of explanatory factors. Because the instrument is exogenous and related to enrollment only through drinking, the sample correlation between the instrument and enrollment is purely a product of that between drinking and enrollment. Thus, the sample correlation between the instrument and enrollment merely needs to be standardized by that between the instrument and drinking in order to be used as an estimate for the causal effect of drinking on

school enrollment. In the case of two or more instruments, $\hat{D}$, the linear projection of Z onto D, takes the place of Z in equation 3.

Equation 3 makes transparent the two important conditions that the instrument vector Z must satisfy in order for IV to produce consistent estimates of the causal drinking effect β_1: First, the instruments must be highly correlated with alcohol use but not correlated with school enrollment through any other mechanism besides drinking. If the correlation between the instruments and drinking is not statistically significant, the denominator in (3) is statistically equal to zero, thus rendering the expression for β_1 indeterminate. The strength of this correlation is judged from the F-statistic for the joint significance of α_1 in equation 1. Minimally, α_1 should be significant at the 1 percent level; beyond this, Staiger and Stock (1997) advise a more stringent requirement that the associated F-statistic be at least 10.

Second, if a direct correlation between the instruments and school enrollment exists outside of the pathway from the instruments to drinking to enrollment, the numerator in (3) includes variation that is not part of the relationship between drinking and enrollment, and consequently the expression is no longer a consistent estimate of the causal effect of drinking. The reason multiple instruments are preferred is this overidentifies equation 2, which allows for specification tests to determine the empirical validity of excluding the instrument set Z from (2).

Under the null hypothesis that the instruments are not separately correlated with school enrollment, the sample size multiplied by the R-squared from a regression of the residual in (2), $\hat{\varepsilon}$, on all the exogenous variables (i.e. a constant, X and Z) is distributed as chi-square with degrees of freedom equal to one less than the number of instruments. Typically, the estimator represented by equation 3 is generated by a two-stage least squares (2SLS) procedure. The first stage estimates equation 1 above using OLS. From the estimated parameters, predicted values of alcohol use, $\hat{D}$, are constructed for each respondent using their corresponding values of the explanatory variables X and instruments Z. The second stage estimates equation 2 using the fitted values $\hat{D}$ in place of observed drinking D.

2SLS yields consistent estimates even when alcohol use and/or education variables are represented by a binary indicator. However, for binary drinking measures, e.g. an indicator of any past month binge drinking, an approach suggested by Wooldridge (2003) to improve efficiency is utilized. It is similar to 2SLS with two modifications. First, before running 2SLS, a preliminary probit regression for equation 1 is estimated. Second, the ensuing 2SLS procedure uses the predicted probabilities of drinking from the probit regression as instruments in place of Z. The resulting estimates are likely to be similar in magnitude to those that would be generated by the analogous 2SLS regression, but standard errors will be slightly smaller.

One other methodological point merits attention. Although IV estimates are consistent if the instrument strength and exogeneity conditions outlined above are satisfied, they are inefficient relative to OLS if it turns out that alcohol use is truly exogenous with respect to school enrollment, in which case the OLS estimates can be interpreted as causal effects. Thus, it

is desirable to econometrically test the null hypothesis that drinking is exogenous in the enrollment equation. This is done using a Hausman (1978) test, which proffers that, if drinking and the error term are uncorrelated, IV and OLS estimates should differ only by sampling error. If the null hypothesis of exogeneity is rejected, OLS estimates are inconsistent and hence conclusions should be based on IV estimates; failure to reject the null means that OLS estimates are preferable because of their smaller standard errors.

SCHOOL ENROLLMENT

Current school enrollment is a binary variable indicating whether the respondent is currently enrolled in middle or high school (including those who are home schooled) or a college/ university. Approximately 99 percent of youth ages 15 and under report attending school, and individuals ages 26 and above who have not graduated from college are particularly likely to have experienced previous gaps in school enrollment, not currently be enrolled and not return to school in the future. The enrollment analysis is conducted utilizing a sample of high-school age students (15-18 years old) and college age students (19-25 years old). For the high school age sample, age 15 is the omitted category in the regressions thus mitigating the effects of compulsory attendance laws which typically require school attendance up to age 16.

DRINKING VARIABLES

Among the varied measures utilized are: the number of days the respondent drank in the past year (which is coded as '0' for nondrinkers and those that consumed no drinks in the previous year) and the number of drinks consumed in the previous month (which is coded as '0' for nondrinkers and those that consumed no drinks in the previous month). Binge drinking is defined as consuming five or more drinks on the same occasion on at least one day in the past thirty days. Although the timing of the number of drinks and binge drinking variables is not an ideal match for the enrolment measure, in the sense that past month consumption cannot literally affect behavior that preceded the past month, this work will follow that of previous studies in assuming that previous month drinking patterns proxy those occurring in the recent period prior to the previous month.

The impact on enrollment from alcohol abuse or dependence in the past year is also examined. This is accomplished by an indicator in the NSDUH of whether respondents exhibited symptoms of alcohol abuse or dependence in the past year. This is retrospectively coded by SAMHSA based on responses to questions corresponding to criteria outlined in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, the clinical standard for establishing drug abuse and dependence.

EXOGENOUS VARIABLES

Several variables from the NSDUH data are considered exogenous (i.e. explanatory) in the model: family income is measured in seven categories: $10,000 or less; $10,000-$19,999; $20,000-$29,999; $30,000-$39,999; $40,000-$49,999; $50,000-$74,999; and $75,000 or greater, with $10,000 or less as the omitted category. Population density is represented by indicators for two categories: an MSA with one million persons or greater and an MSA of less than one million persons, with non-MSA areas as the omitted category. A binary measure is included for whether the respondent has ever been arrested. For race, indicators are specified for African Americans, Native Americans, Asians, non-white Hispanics and multiracial, with Caucasians as the omitted category in the regressions. Family size is measured using two variables: the number of members if the household has one to five members and an indicator for those with over five members. A binary measure of gender is included as well.

Age indicators for the high school age sample are 16, 17, or 18 years old and 19, 20, 21, 22 or 23, 24 or 25 years old for the college age sample. Indicators for the last grade completed is 9^{th}, 10^{th} or 11^{th} grade (with 12^{th} as the omitted grade) for the high school age sample and freshman or sophomore/ junior (with senior as the omitted category) for the college age sample.

INSTRUMENTAL VARIABLES

Several NSDUH variables conceivably influence drinking without having direct effects on school enrollment and are thus candidates to serve as instrumental variables. The specific variables utilized for the high school age sample are: perceived risk of bodily harm from alcohol use; whether religious beliefs are important and whether religious beliefs influence decisions. The specific variables utilized for the college age sample are: perceived risk of bodily harm from alcohol use; perceived risk of bodily harm from marijuana use and whether religious beliefs influence decisions.

For alcohol risk, a binary measure indicates if the respondent feels there are great/ moderate risks or slight/ no risks of harm, physically or otherwise, from consuming four to five drinks once or twice a week. For marijuana risk, a binary measure indicates if the respondent feels there are great/ moderate risks or slight/ no risks of harm, physically or otherwise, from using marijuana once or twice a week. Given that these variables only pertain to consuming illegal substances, it is presumed that there is no direct influence on school enrollment.

For both religion variables, a binary variable is created and coded as '0' if religion is not important or does not influence decisions and '1' otherwise. Religiosity has been linked to drinking behaviors (Kenkel and Ribar, 1994) but some evidence has established exogeneity with respect to educational outcomes (Wolaver, 2002). All instrumental variables undergo extensive testing in the following section.

EMPIRICAL FINDINGS

The causal effect drinking has on the probability of school enrollment is estimated using the three instrumental variables listed above. The main results of the IV analysis are also compared with parameter estimates obtained using OLS methodology. While discussion that follows concentrates on the effects of alcohol consumption and specification tests, appendix 1, for the binge drinking measure, shows the IV coefficients and marginal effect standard errors of all exogenous variables on the probability of enrollment for the high school age sample. Appendix 2 does the same for the college age sample.

Tables 1 and 2 present select summary statistics. The mean number of days drinks were consumed in the past year is about 18 (high school age) and 50 (college age) while the mean number of drinks consumed in the past month is 5.7 (high school age) and 15.5 (college age). Mean alcohol abuse/ dependence is 0.08 (high school age) and 0.14 (college age). Mean school enrollment is 0.44 for those of college age, and as expected, very high (0.93) for the high school age sample. Mean reported family income for college age sample is lower across the board as individuals of this age have moved out of the parental household. About 90 percent of respondents in both samples live in an MSA, roughly equally split between MSAs with populations greater than and less than one million. African Americans comprise about 14 percent of both samples while non-white Hispanics account for about 16 percent of the high school sample and 19 percent of the college sample.

Table 1. Descriptive Statistics (high school age sample) (n=19,022)

Variable	Mean	Standard Deviation
Number of days drank-past year	17.823	45.594
Number of drinks in previous month	5.703	32.916
Binge drinking in the past 30 days	0.119	0.324
Abuse/ Dependence on alcohol classification	0.080	0.272
Respondent perceives risk of harm from drinking	0.762	0.426
Religious beliefs are important in life	0.720	0.449
Religion influences your decisions	0.633	0.482
Probability of school enrollment	0.931	0.253
Family income ($10,000-$19,999)	0.108	0.310
Family income ($20,000-$29,999)	0.116	0.320
Family income ($30,000-$39,999)	0.105	0.307
Family income ($40,000-$49,999)	0.106	0.308
Family income ($50,000-$74,999)	0.190	0.392
Family income ($75,000 or more)	0.287	0.452
MSA segment with 1+ million persons	0.417	0.493

Table 1. Descriptive Statistics (high school age sample) (n=19,022)

Variable	Mean	Standard Deviation
MSA segment of less than 1 million	0.486	0.500
Age of student (15 years old)	0.282	0.450
Age of student (16 years old)	0.278	0.448
Age of student (17 years old)	0.272	0.445
Age of student (18 years old)	0.255	0.436
Last grade in (9th grade)	0.015	0.123
Last grade in (10th grade)	0.135	0.342
Last grade in (11th grade)	0.306	0.461
Last grade in (12th grade)	0.300	0.458
Ever been arrested	0.096	0.498
Race (African American)	0.146	0.354
Race (Native American)	0.016	0.124
Race (Asian)	0.033	0.179
Race (non-white Hispanic)	0.165	0.371
Number in family	3.191	1.543
Number in family (>5)	0.139	0.346

Table 2. Descriptive Statistics (college age sample) (n=20,666)

Variable	Mean	Standard Deviation
Number of days drank-past year	49.773	76.094
Number of drinks in previous month	15.536	50.292
Binge drinking in the past 30 days	0.300	0.458
Abuse/ Dependence on alcohol classification	0.148	0.355
Respondent perceives risk of harm from drinking	0.891	0.310
Religion influences your decisions	0.627	0.483
Respondent perceives risk of harm from marijuana	0.790	3.506
Probability of school enrollment	0.441	0.496
Family income ($10,000-$19,999)	0.156	0.362
Family income ($20,000-$29,999)	0.139	0.346
Family income ($30,000-$39,999)	0.116	0.321
Family income ($40,000-$49,999)	0.111	0.314
Family income ($50,000-$74,999)	0.140	0.347
Family income ($75,000 or more)	0.161	0.367

Table 2. Descriptive Statistics (college age sample) (n=20,666)

Variable	Mean	Standard Deviation
MSA segment with 1+ million persons	0.399	0.489
MSA segment of less than 1 million	0.516	0.499
Age of student (19 years old)	0.157	0.364
Age of student (20 years old)	0.140	0.347
Age of student (21 years old)	0.126	0.332
Age of student (22 or 23 years old)	0.205	0.403
Age of student (24 or 25 years old)	0.189	0.392
Freshman	0.148	0.355
Sophomore/ Junior	0.191	0.393
Ever been arrested	0.193	0.395
Race (African American)	0.142	0.349
Race (Native American)	0.017	0.129
Race (Asian)	0.031	0.174
Race (non-white Hispanic)	0.192	0.394
Number in family	2.950	1.388
Number in family (>5)	0.104	0.305

FIRST STAGE REGRESSION RESULTS

Table 3 presents the probit results for the drinking measures on the instruments for the high school age sample. Of those who perceive that there is moderate to great risk of harm from consuming alcohol, the number of days drinking occurred in the past year is lowered by about 23 days. The number of drinks consumed in the past month is reduced by 11, while the likelihood of binge drinking in the last 30 days falls by 0.13 percentage points. The likelihood of being categorized as abusive/ dependent on alcohol falls by 0.09 points.

Importance of religious beliefs reduces all alcohol use measures. For those that report that religion is important in life, the number of days drinking occurred in the past year is lowered by approximately one day. The number of drinks consumed in the past month is reduced by 0.30, while the probability of binge drinking in the last 30 days falls by 0.02 percentage points. The likelihood of being categorized as abusive/ dependent on alcohol falls by 0.007 points.

When religiosity impacts decisions, the effects on the drinking measures are more pronounced. The number of days drinking occurred in the past year is lowered by nine days. The number of drinks consumed in the past month is reduced by about two, while the probability of binge drinking in the last 30 days falls by 0.45 points. The likelihood of being categorized as abusive/ dependent on alcohol falls by 0.04 points. The χ^2 coefficients and associated p-values indicate that the instruments are jointly significant for all the drinking measures.

Table 3. First stage regression estimates for the probability of enrollment (high school age) (n=19,022)				
exogeneous variables	number of days drank in past year	number of drinks in past month	Binge drinking	Abuse/ Dependence on alcohol
Risk of bodily harm from drinking	-22.895	-10.946	-0.130	-0.089
	(1.012)	(0.766)	(0.007)	(0.006)
Religious beliefs are important in life	-0.891	-0.030	-0.016	-0.007
	(0.912)	(0.691)	(0.006)	(0.006)
Religion influences your decisions	-8.676	-2.830	-0.045	-0.036
	(0.854)	(0.646)	(0.006)	(0.005)
F stat/ chi2-coefficient of joint significance	249.05	82.12	418.29	272.28
P-value of significance level	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Table 4. First stage regression estimates for the probability of enrollment (college age) (n=20,666)				
exogeneous variables	number of days drank in past year	number of drinks in past month	Binge drinking	Abuse/ Dependence on alcohol
Risk of bodily harm from drinking	-42.628	-18.468	-0.201	-0.105
	(1.579)	(1.067)	(0.009)	(0.007)
Risk of bodily harm from using marijuana	-0.816	-0.280	-0.003	-0.002
	(0.138)	(0.093)	(0.008)	(0.001)
Religion influences your decisions	-15.077	-4.690	-0.086	-0.039
	(1.018)	(0.688)	(0.006)	(0.005)
F stat/ chi2-coefficient of joint significance	352.67	125.76	665.92	241.11
P-value of significance level	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Table 4 presents the probit results for the instruments for the college age group. For this age group, if moderate to great risk of harm from consuming alcohol is perceived, the number of days in which drinking occurred in the past year is lowered by 42 days. The number of drinks consumed in the past month is reduced by roughly18, while the probability of binge drinking in the last 30 days falls by 0.20 percentage points. The likelihood of being categorized as abusive/ dependent on alcohol decreases by 0.11 points.

If moderate to great risk of harm from using marijuana is perceived, the number of days in which drinking occurred in the past year is lowered by one day. The number of drinks consumed in the past month is reduced by 0.28, while the probability of binge drinking in the last 30 days falls by 0.003 percentage points. The likelihood of being categorized as abusive/ dependent on alcohol falls by 0.002 points. When religiosity impacts decisions, the number of days in which drinking occurred in the past year is reduced by 15 and the number of drinks

consumed in the past month is reduced by four. The probability of binge drinking in the last 30 days falls by 0.09 percentage points while the likelihood of being categorized as abusive/ dependent on alcohol falls by 0.04 points. The F statistics and χ^2 p-values signify support for the hypothesis of joint instrument significance for all the drinking measures.

THE EFFECTS OF DRINKING ON THE PROBABILITY OF SCHOOL ENROLLMENT (HIGH SCHOOL AGE)

As shown in table 5, drinking has significant, negative effects on the probability of being enrolled. For each daily increase in past year drinking, the probability of being enrolled is subsequently lowered by 0.001. For each additional drink increase in the past month, the probability of enrollment is also lowered by 0.003. If, for instance, the respondent reports drinking 52 days in the previous year, the likelihood of enrollment is diminished by approximately 0.052 points compared to not drinking at all. If the student reports consuming 30 drinks in the previous month, the probability of enrollment decreases by 0.09 points.

Table 5. IV estimates of drinking on the probability of enrollment (high school age) All three instruments (n=19,022)

Alcohol variables	IV	OLS
number of days drank-past year	-0.001*	-0.0002*
Marginal Effect Standard Error	(0.0002)	(0.0000)
P-value of overidentification test	0.828	
Hausman statistic (p-value)	-5.243 (0.000)	
number of drinks in past month	-0.003*	-0.0003*
Marginal Effect Standard Error	(0.0006)	(0.0001)
P-value of overidentification test	0.303	
Hausman statistic (p-value)	-4.483 (0.000)	
binge drinking	-0.230*	-0.0042*
Marginal Effect Standard Error	(0.040)	(0.0054)
P-value of overidentification test	0.649	
Hausman statistic (p-value)	-5.772 (0.000)	
abuse/ dependence on alcohol	-0.329*	0.0017*
Marginal Effect Standard Error	(0.060)	(0.0060)
P-value of overidentification test	0.825	
Hausman statistic (p-value)	-5.624 (0.000)	
*Statistically significant at 1%		

Binge drinking further reduces the probability of enrollment by 0.23 points. For students who have engaged in binge drinking, the probability of school enrollment declines by approximately 24 percent compared to not binging. For those classified as abusive/ dependent with respect to alcohol, the probability of enrollment decreases by 0.32 points and this categorization reduces the probability of school enrollment by 35 percent. For all drinking indicators, the overidentification tests have associated p-values that offer strong evidence in support of the assumption of instrument exogeneity at the 10 percent level. The p-values associated with the Hausman coefficient signify that there are statistically significant differences between the OLS and IV parameter estimates for all the drinking measures.

Overall, in the high school sample, there is a strong indication that drinking, possibly by raising the opportunity cost of high school education, impairing cognitive functioning, etc., reduces enrollment in high school. And, considering the additional resources the student devotes toward drinking if the student binge drinks or is abusive/ dependent on alcohol, there is compelling evidence that the probability of high school enrollment is largely and negatively impacted.

INSTRUMENT ROBUSTNESS AND THE PROBABILITY OF ENROLLMENT (HIGH SCHOOL AGE)

To determine if there is any sensitivity in the main results attributable to changes in the instrument set, regressions are performed with varying pairs of instruments with results presented in table 6. The instrument that is omitted from the IV combination is utilized as an explanatory variable and its coefficient and standard error is reported.

For all drinking variables, the effect on enrollment using IV pairs is remarkably similar to those in the main regression where all three instruments are employed. For all drinking variables the overidentification test results support exogeneity for all IV pairs. Hausman tests indicate there are statistically significant differences between IV and OLS estimates in all specifications and the additional instrument not used to identify drinking is never significant in the enrollment equation.

THE EFFECTS OF DRINKING ON THE PROBABILITY OF SCHOOL ENROLLMENT (COLLEGE AGE)

As shown in table 7, drinking has significant, negative effects on the probability of being enrolled for the college age group. For each daily increase in past year drinking, the probability of being enrolled is subsequently lowered by 0.001. For each additional drink increase in the past month, the probability of enrollment is also lowered by 0.002. If, for instance, the respondent reports drinking 52 days in the previous year, the likelihood of enrollment is diminished by

approximately 0.052 points compared to not drinking at all. If the student reports consuming 30 drinks in the previous month, the probability of enrollment decreases by 0.06 points.

Binge drinking and abuse/ dependence on alcohol further reduce the probability of enrollment by 0.19 points. For students who have engaged in binge drinking, the probability of school enrollment declines by approximately 43 percent compared to not binging. For those classified as abusive/ dependent with respect to alcohol, the probability of enrollment decreases by 0.37 points. Categorization as abusive/ dependent reduces the probability of school enrollment by 83 percent.

Table 6. IV estimates of drinking on the probability of enrollment using IV pairs (high school age) (n=19,022)

Alcohol variables	religion important and alcohol risk	religious decisions and alcohol risk	religion important and religious decisions
number of days drank-past year	-0.001*	-0.001*	-0.002*
Marginal Effect Standard Error	(0.0003)	(0.0003)	(0.0004)
P-value of overidentification test	0.942	0.828	0.931
Hausman statistic (p-value)	-3.958 (0.000)	-4.759 (0.000)	-3.360 (0.000)
Coefficient (Standard Error) of omitted IV	0.002 (0.005)	-0.0002 (0.004)	-0.005 (0.012)
number of drinks in past month	-0.003*	-0.003*	-0.005*
Marginal Effect Standard Error	(0.0007)	(0.0006)	(0.0016)
P-value of overidentification test	0.992	0.429	0.995
Hausman statistic (p-value)	-3.627 (0.000)	-4.128 (0.000)	-3.024 (0.000)
Coefficient (Standard Error) of omitted IV	0.006 (0.004)	0.004 (0.004)	-0.025 (0.020)
binge drinking	-0.220*	-0.239*	-0.240*
Marginal Effect Standard Error	(0.051)	(0.047)	(0.067)
P-value of overidentification test	0.702	0.739	0.662
Hausman statistic (p-value)	-4.354 (0.000)	-5.197 (0.000)	-3.577 (0.000)
Coefficient (Standard Error) of omitted IV	0.002 (0.005)	-0.002 (0.005)	-0.002 (0.011)
abuse/ dependence on alcohol	-0.323*	-0.341*	-0.333*
Marginal Effect Standard Error	(0.078)	(0.069)	(0.095)
P-value of overidentification test	0.834	0.906	0.826
Hausman statistic (p-value)	-4.238 (0.000)	-5.092 (0.000)	-3.602 (0.000)
Coefficient (Standard Error) of omitted IV	0.001 (0.005)	-0.002 (0.005)	-0.001 (0.011)
*Statistically significant at 1%			

Table 7. IV estimates of drinking on the probability of enrollment (college age) All three instruments (n=20,666)		
Alcohol variables	IV	OLS
number of days drank-past year	-0.001*	-0.0001*
Marginal Effect Standard Error	(0.0002)	(0.0000)
P-value of overidentification test	0.162	
Hausman statistic (p-value)	-5.043 (0.000)	
number of drinks in past month	-0.002*	-0.0002*
Marginal Effect Standard Error	(0.0004)	(0.0001)
P-value of overidentification test	0.082	
Hausman statistic (p-value)	-4.528 (0.000)	
binge drinking	-0.191*	-0.0112*
Marginal Effect Standard Error	(0.0359)	(0.0070)
P-value of overidentification test	0.263	
Hausman statistic (p-value)	-5.963 (0.000)	
abuse/ dependence on alcohol	-0.376*	0.0127*
Marginal Effect Standard Error	(0.0756)	(0.0080)
P-value of overidentification test	0.225	
Hausman statistic (p-value)	-5.258 (0.000)	
*Statistically significant at 1%		

For number of days drinking occurred in the past year, binging and abuse/ dependence on alcohol, the overidentification tests have associated p-values that afford strong evidence in support of the assumption of instrument exogeneity at the 10 percent level. Even for the past month drinking variable, instrument exogeneity is not rejected at the 5 percent level. The p-values associated with the Hausman coefficient signify that OLS and IV estimates statistically differ for all the drinking measures.

The estimated effects for binge drinking and abuse/ dependence are quite large, possibly indicating that for college age individuals, resources (monetary and otherwise) spent on drinking undercut the probability of post high school education, especially considering that there are greater costs (especially monetary) associated with obtaining education at that age. In addition, if the college age person has a history of drinking, especially at abuse and dependence levels, pre-college academic achievement might have been much lower thus precluding post high school enrollment in colleges, universities and other institutions.

INSTRUMENT ROBUSTNESS AND THE PROBABILITY OF SCHOOL ENROLLMENT (COLLEGE AGE)

To determine if there is any sensitivity in the main results attributable to changes in the instrument set, regressions are performed with varying pairs of instruments with results presented in table 8. Again, the instrument that is omitted from the IV combination is utilized as an explanatory variable and its coefficient and standard error is reported.

Table 8. IV estimates of drinking on the probability of enrollment using IV pairs (college age) (n=20,666)

Alcohol variables	religious decisions and alcohol risk	religious decisions and marijuana risk	alochol risk and marijuana risk
number of days drank-past year	-0.001*	-0.001*	-0.001*
Marginal Effect Standard Error	(0.0002)	(0.0003)	(0.0002)
P-value of overidentification test	0.456	0.215	0.353
Hausman statistic (p-value)	-5.211 (0.000)	-3.081 (0.000)	-3.574 (0.000)
Coefficient (Standard Error) of omitted IV	0.001 (0.001)	-0.013 (0.018)	-0.001 (0.007)
number of drinks in past month	-0.002*	-0.004*	-0.002*
Marginal Effect Standard Error	(0.0004)	(0.0010)	(0.0005)
P-value of overidentification test	0.177	0.213	0.447
Hausman statistic (p-value)	-4.627 (0.000)	-2.865 (0.000)	-3.448 (0.000)
Coefficient (Standard Error) of omitted IV	0.001 (0.001)	0.030 (0.025)	-0.003 (0.007)
binge drinking	-0.202*	-0.213*	-0.165*
Marginal Effect Standard Error	(0.036)	(0.064)	(0.043)
P-value of overidentification test	0.718	0.289	0.350
Hausman statistic (p-value)	-6.102 (0.000)	-3.605 (0.000)	-4.287 (0.000)
Coefficient (Standard Error) of omitted IV	0.001 (0.001)	-0.006 (0.016)	-0.002 (0.007)
abuse/ dependence on alcohol	-0.396*	-0.458*	-0.320*
Marginal Effect Standard Error	(0.078)	(0.148)	(0.086)
P-value of overidentification test	0.550	0.295	0.401
Hausman statistic (p-value)	-5.357 (0.000)	-3.216 (0.000)	-3.911 (0.000)
Coefficient (Standard Error) of omitted IV	0.001 (0.001)	-0.012 (0.020)	-0.002 (0.007)
*Statistically significant at 1%			

For all drinking variables, the effect on enrollment is remarkably similar to those in the main regression. For all drinking variables the overidentification test results support the exogeneity hypothesis for all IV pairs. Hausman tests indicate there are statistically significant

differences between IV and OLS estimates in all specifications and the additional instrument not used to identify drinking is never significant in the enrollment equation.

Overall, the robustness evaluation for both samples offers strong evidence to support the hypothesis that instruments are exogeneous. Throughout the analyses, OLS parameter estimates consistently underestimate the magnitude of the negative effects in the main specification for enrollment. This could be ascribed to the prospect that higher ability (i.e. higher achieving) students perform better academically even when they drink. And these higher achievers are more likely to be enrolled in school. In addition, higher income students (who spend more on alcohol and therefore drink more) also command more resources that can be channeled toward education, such as test preparation for the SAT, and simply have more money to pay for college, and, once in college, funds to pay for tutoring services, etc. This in turn could serve to keep enrollment elevated.

CONCLUDING REMARKS

This paper contributes to the literature by examining the effects of youth drinking on the probability of school enrollment while accounting for unobserved endogeneity. The literature has established a negative link between drinking and educational variables, but many of these studies do not account for the possibility that the negative correlation between these factors may be the result of unobserved variables that cause simultaneous increases in drinking and reductions in educational variables. And, for studies that have incorporated unobserved endogeneity, instrumental variable procedures have been subject to criticism.

This study finds strong evidence that the probability of school enrollment is lowered when students use alcohol more frequently and intensely. Binge drinking and abuse of alcohol have the most detrimental impact on enrollment. Throughout the analysis, overidentification tests generally confirm instrument exogeneity and thus show that adolescent alcohol consumption should be treated as endogenous. OLS regressions consistently underestimate the effects of alcohol use on enrollment.

Although there is no direct analysis of the effectiveness of laws and other programs designed to curtail youth drinking, the conclusions in this paper support the premise that reducing adolescent alcohol use enhances human capital accumulation. Minimum legal drinking ages, high school anti-drug programs and other policies aimed at lowering youth drinking may well be justified on human capital grounds. Although the instrumental variables prove to be very effective and useful, further research should include continued exploration for reliable instruments to ensure that the relationship between drinking and academic outcomes is properly identified. A further examination of the effectiveness of public policies that purport to reduce youth drinking would also prove valuable.

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Appendix 1. All IV estimates on the probability of enrollment for binge drinking (high school age) (n=19,022)

Explanatory variables	IV coefficient (Marginal Effect SE)
Binge drinking	-0.229 (0.040)
Female	-0.005 (0.003)
Race (African American)	-0.003 (0.006)
Race (Native American)	-0.026 (0.017)
Race (Asian)	0.028 (0.007)
Race (non-white Hispanic)	-0.034 (0.005)
Age of student (16 years old)	-0.034 (0.005)
Age of student (17 years old)	-0.124 (0.007)
Age of student (18 years old)	-0.255 (0.009)
Last grade completed (9th grade)	0.001 (0.005)
Last grade completed (10th grade)	0.044 (0.007)
Last grade completed (11th grade)	0.141 (0.008)
Ever been arrested	-0.031 (0.010)
Number in family	-0.007 (0.002)
Number in family (>5)	-0.058 (0.015)
Family income ($10,000-$19,999)	-0.045 (0.011)
Family income ($20,000-$29,999)	-0.017 (0.109)
Family income ($30,000-$39,999)	-0.005 (0.010)
Family income ($40,000-$49,999)	0.011 (0.010)
Family income ($50,000-$74,999)	0.024 (0.009)
Family income ($75,000 or more)	0.032 (0.009)
MSA segment with 1+ million persons	-0.003 (0.006)
MSA segment of less than 1 million	-0.007 (0.006)
Year 2006 indicator	-0.027 (0.006)

Appendix 2. All IV estimates on the probability of enrollment for binge drinking (college sample) (n=20,666)

Explanatory variables	IV coefficient (Marginal Effect SE)
Binge drinking	-0.191 (0.035)
Female	-0.027 (0.007)
Race (African American)	-0.009 (0.011)
Race (Native American)	-0.026 (0.022)
Race (Asian)	0.111 (0.016)
Race (non-white Hispanic)	-0.068 (0.008)
Age of student (19 years old)	-0.271 (0.007)
Age of student (20 years old)	-0.434 (0.010)
Age of student (21 years old)	-0.503 (0.011)
Age of student (22-23 years old)	-0.599 (0.010)
Age of student (24-25 years old)	-0.690 (0.009)
Last grade completed (Freshman)	0.350 (0.008)
Last grade completed (Sophomore/ Junior)	0.512 (0.008)
Ever been arrested	-0.030 (0.010)
Number in family	-0.012 (0.003)
Number in family (>5)	-0.103 (0.014)
Family income ($10,000-$19,999)	-0.115 (0.010)
Family income ($20,000-$29,999)	-0.133 (0.010)
Family income ($30,000-$39,999)	-0.122 (0.010)
Family income ($40,000-$49,999)	0.125 (0.011)
Family income ($50,000-$74,999)	0.086 (0.010)
Family income ($75,000 or more)	0.027 (0.010)
MSA segment with 1+ million persons	0.082 (0.011)
MSA segment of less than 1 million	0.060 (0.010)
Year 2006 indicator	-0.056 (0.010)

THE IMPACT OF MULTIPLE WORK ARRANGEMENTS ON LABOR PRODUCTIVITY

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ABSTRACT

Measuring productivity is an important performance measure for decision making and resource allocation in managerial accounting. One factor which may affect labor productivity is the use of multiple work arrangements (MWA) such as fulltime employees, contract workers and independent contractors. Most of the prior research in accounting on MWA focused on the behavioral aspects of different work scenarios. There has been limited research in managerial accounting about the impact of MWA on the economics of labor productivity which is the focus of this study.

This paper examines the economic impact of MWA in long haul trucking companies. Specifically, we investigated the use of independent contractors (owner-operator drivers) versus fulltime company drivers and their impact on labor productivity. In a managerial context, owner-operators represent soft capacity and company drivers represent hard capacity. Our results indicate that owner-operators will improve the productivity of the company. There is a significant and positive association between the use of owner-operators and labor productivity. Prior studies did not find this positive relationship. Our results indicate that owner-operators can influence the variance of labor productivity either positively or negatively. However, there is more variability associated with the performance of owner-operators than there is with company drivers.

INTRODUCTION

This study investigates the influence of multiple work arrangements (MWA) such as full-time employees and independent contractors on the labor productivity in long-haul trucking companies. Specifically, we examine whether the levels of soft capacity in production affect the levels and the variances of labor productivity. Balakrishnan and Sivaramakrishnan (2002) define soft capacity as the resources having constraints that can be relaxed with a premium and hard capacity as the resources having constraints that cannot be relaxed in the short run. In this study, the independent contractors are considered as flexible resources (acquired as used and needed). Using the Motor Carrier Financial & Operating Information database, we compare the level and the variance of labor productivity across firms with different levels of soft capacity usage. The findings suggest that the level and the variance of labor productivity are significantly associated

with the soft capacity ratio. Ittner and Larcker (1998b) suggest that there are many firm-specific, structural and environmental factors affecting the use and performance consequences of performance measures. These results provide empirical evidence that production capacity based on multiple work arrangements affects labor productivity as a performance measure. We show that the measure of multiple employment arrangements such as the soft capacity ratio associates negatively with the variance of labor productivity and positively with the level of labor productivity. The findings can help owners increase the congruence of the performance measures to management objectives and improve investors' understanding of the information content of labor productivity as a non-financial performance measure in the firm's valuation process.

In recent years, using multiple work arrangements (MWA) such as full-time employees, contract workers and independent contractors has become a prominent way of organizing production capacity for companies in different industries and professions (Lepak et al.. 2003; Matusik and Hill 1998; Davis-Blake and Uzzi 1993). For instance, according to the Current Population Survey (CPS) conducted by the Bureau of Census, 10.3 million people or 7.4 percent of the employed were working as independent contractors in February 2005. The proportion of nonstandard workers to the total employed in the U.S. is estimated to be as high as 26.3 percent in February 1995 (Houseman and Polivka 1999). Kalleberg, Reskin and Hudson, 2000, define standard employment arrangements as "the exchange of a worker's labor for monetary compensation from an employer, with work done on a fixed schedule, usually full-time, at the employer's place of business, under the employer's control, and with the mutual expectation of continued employment." As this discernible trend towards the nonstandard work arrangements and MWA becomes more diffuse and diverse, it is important for both internal and external decision makers to understand more about the implications of the employers' labor utilization or production capacity strategy on labor productivity.

Among different performance measures, productivity measures have historically received little attention in the existing accounting research [see Banker, Datar and Kaplan (1989) and Callen, Morel and Fader (2005)]. However, productivity is one of the most important performance measures used by corporate managers in making investment decisions and decisions regarding the utilization of both tangible and intangible assets. Banker, Datar and Kaplan (1989) suggest that productivity improvement can come from intangibles such as efficient labor use; new capital investment; or process improvement efforts. Productivity improvement is generally regarded as a driver of a firm's long-term profitability and value and, therefore, productivity improvement is an important leading indicator of a firm's performance (Kaplan 1983). To date, however, there is little or no empirical research in accounting about the impact of MWA on labor productivity. The fact that little is known about the factors that affect the information content of labor productivity measures may limit firms from fully utilizing productivity measurements to monitor and evaluate managers for internal control and contracting purposes. Also, companies may not be able to design effective labor productivity improvement programs if they do not understand the potential factors that affect labor productivity. This would

likely have a negative impact on the firms' sustainable competitiveness and their future performance. Moreover, it may affect their use of labor productivity measurements to assess a firm's expected future payoff by potential investors.

This study proceeds as follows. We will review the literature related to the study and provide an overview of the trucking industry and the van truckload business segment. Then we discuss the development of our hypothesis, research methodology and describe the data. Next, the results of hypothesis testing are reported and discussed. Finally, we summarize our conclusions.

LITERATURE REVIEW

Multiple work arrangements are the various combinations of standard (i.e. full time, continue indefinitely and under the employer's supervision) and non-standard (i.e. part-time, temporary and independent contractor work) employment relationships in organizations (Kalleberg 2000, 2001). The use of MWA is increasingly widespread (Houseman 2001). For example, from 1972 to 2000, the personnel supply employment (temporary workers) grew more than 10 times from 0.27 percent to 2.81 percent while the total nonfarm employment only increased less than 2 times from 71 million to 127 million workers (Wenger and Kalleberg 2006). The proportion of nonstandard workers to the total employed in the U.S. is estimated to be as high as 26.3 percent in February 1995 (Houseman and Polivka 1999).

The study of the consequences and implications of MWA focuses on the differences that MWA bring to the workplace. Broschak and Davis-Blake (2006) show that higher proportions of nonstandard workers such as part-time and temporary workers are associated more with unfavorable attitudes toward supervisors and co-workers, higher turnover intentions and lower job-related helping behaviors. Houseman and Polivka (1999) note nonstandard workers, except for independent contractors, do not have the same job stability as the standard workers. Matusik and Hill (1998) suggest that MWA can accumulate and create valuable knowledge for organizations and provide a competitive advantage in a dynamic environment. Smith, 2002 suggests that MWA can be potentially beneficial for all employees. Lepak et al. (2003) show the levels of knowledge-based employment and contract work are positively related to future firm performance. However, other studies also show that firms depending on independent contractors are significantly less profitable than firms depending completely on standard employees (Corsi and Grimm1987; Ozment et al. 2002). To our best knowledge, empirical studies about the potential impact of independent contractors on labor productivity do not exist.

Traditionally, financial performance measures (FPMs) have been used to monitor and evaluate managers or firms. However, these measures have been criticized as lagging indicators that encourage shortsighted effort and discourage farsighted financial performance in companies. More specifically, these measures assess only the utilization of tangible assets in prior periods. As companies build their strategies and operations around intangible assets, such as business processes and human resources, many researchers and practitioners argue that non-financial

performance measures (NFPMs) may be better measures for assessing managerial performance. These measures are purported to better measure the creation and deployment of these intangible assets, and may be better, more relevant indicators of long-term corporate health than the traditional accounting metrics.

Productivity is considered to be one of the key drivers of firm value by both economists and accountants (Baily et al. 1981, Bao and Bao 1989). Productivity measures are ratios of outputs to inputs that allow users to compare and understand differences in the physical use of resources within companies at different time periods or across different companies in the same industry at the same time. There are two types of productivity measures: total factor productivity, which measures the ratios of total outputs to total inputs; partial productivity, which measures the ratios of the outputs to a specific input.

Kaplan (1983) contends that firm-level productivity measurements can provide information about a firm's comprehensive measure of the real efficiency gains, which allow users to separate the unsustainable value created by the changes in relative costs and prices from the sustainable value gained by real improvement in efficiency in financial performance measurements. This suggests that the net benefits from investments in productivity may not be fully captured in contemporaneous FPMs because improvement in productivity is assumed to be sustainable into the future. It also implies that a productivity measure can provide information about the manager's action that may affect future profitability. Said, HassabElnaby and Wier (2003) report that when firms employ both financial and nonfinancial performance measures such as productivity in their compensation contracts, they have significantly higher firm performance.

In general, there are only limited empirical studies of the MWA's impact on firm level performance. Ozment, Spraggins and Tokar (2002) study the effects of independent contractors (owner-operators) usage by truckload carriers on productivity and profitability. They suggest that the carriers relying on standard employment (company drivers) have better performance than the carriers relying on the nonstandard employment (owner-operators). They also suggest that carriers depending on company drivers are more profitable because these companies can charge a premium for their service when compared to the carriers relying on owner-operators.

Corsi and Stowers (1991) suggest that carriers relying on owner-operators (independent contractors in the trucking industry) are less competitive because of higher insurance costs, lower service quality and reliability, and more safety problems associated with the owner-operators. They also suggest that the carriers' operational strategy, regulatory environment and industry life cycle are the determinants of MWA. They argue that as carriers compete on both costs and service levels, carriers will use fewer owner-operators.

Overall, these empirical studies presented mixed evidence on the MWA's impact on firm performance. On one hand, the studies that show a positive relationship between MWA and firm performance tend to suggest firm performance is associated with the competitive advantage of flexibility provided by the use of MWA (Wright and Snell, 1998). On the other hand, studies that

show a negative relationship between MWA and firm performance tend to suggest that transaction costs of MWA outweigh its benefits, and therefore have a negative impact on firm performance. Also, most of these studies, except Lepak et al. (2003), do not investigate the factors that may enhance or diminish MWA's impact on firm performance.

TRUCKING INDUSTRY

Since companies' operating data generally are not accessible, archival studies on MWA and labor productivity are rare. However, the trucking industry provides an excellent opportunity to study these topics because Federal regulations require all trucking companies with adjusted annual operating revenue of three million dollars or more to file Motor Carrier Financial & Operating Information with the Federal Motor Carrier Safely Administration. Therefore, data for the FPMs and NFPMs of both publicly-traded and privately-held trucking companies were available from the Department of Transportation.

The trucking industry can be sub-divided into three major segments. One is the segment separated by the length of haul. Trucking companies can be categorized into ones that provide primarily intercity services (long haul) and the ones that provide services within-city (short haul). Second is the segment divided by the availability to the public. Trucking companies can either move the goods of others for payment (for-hire) or move their own goods primarily (private-carriage). Third is the segment separated by the lot size. Within the for-hire segments, companies can either move truckloads lots (TL) of goods from origin to destination directly, or companies can consolidate and move less-than-truckload lots (LTL) of goods through a network of terminals.

The trucking industry was highly regulated between 1935 and 1980. The Motor Carrier Act of 1980 changed the industry tremendously. It eliminated the regulatory barriers to entry, particularly the requirement for a route and commodity-specific operating requirement. It lifted the pricing restrictions and allowed companies to develop their operating capacity without restrictions. It provided the opportunity to the truckload (TL) sector to become the biggest segment in the industry. The trucking industry has evolved into a mature, highly competitive and fragmented industry since deregulation in 1980.

Although deregulation brought competition and huge gains in productivity to the industry, it also posed many challenges to the industry. As trucking rates per mile declined significantly, so did profit margins. Publicly traded truckload carriers, on average, can only make around a five percent profit margin. Trucking companies compete with each other mainly on the basis of operation efficiency and utilization of existing resources; however, the investment and development of new resource positions are crucial for firms to achieve sustained growth (Pettus 2003).

The TL segment of the trucking industry was selected for analysis for several reasons. First, compared to $27 billion revenue in the less-than-truckload (LTL) sector, the TL segment, with total revenue of $110 billion, is the largest for-hire industry segment in terms of total

revenue. There are about 53,000 TL firms, of which 40,000 are very small, with five or fewer tractors. The remaining 13,000 TL companies, a large number compared to any other segments of the for-hire business, generate about 91 percent of sector revenue.

Second, the TL segment is quite homogeneous in its operating characteristics and market structure, but is different from the operating structure faced by the LTL sector and the private carriage sector. According to the U.S. Department of Transportation, 43 percent of the total TL revenue is with small and middle-sized TL firms (firms with fewer than 100 tractors), while 88 percent of the total TL revenue is from long-haul service. Boyer and Burks (2003) suggest that in order to measure the productivity in the trucking industry correctly, it is important to control for the equipment type and the heterogeneity of the sector. The TL sector, therefore, offers an opportunity to focus on relatively homogeneous outputs and equipment. Measuring productivity of the trucking companies by the standard ton-mile measure per truck or per driver in the TL sector will have less measurement error caused by the factors such as drivers' wages, fuel costs and geographic locations.

Third, high driver turnover is a serious problem faced by the TL carriers. This is because TL drivers have irregular and shifting work times, long working hours on the road, and long periods of time away from home. In order to alleviate the problem of high driver turnover, many TL companies use owner-operators (independent contractors). In addition, managers can improve companies' performance and productivity by contracting or outsourcing more owner-operator drivers in their operations. There are approximately 300,000 owner-operators in total. Most of them are working under contracts to larger TL companies.

The owner-operator drivers are considered as the soft capacity, which does not require commitment in investment in both equipment (tangible assets) and management (intangible assets) relative to the decision of employing company-hired drivers, which requires investment and commitment in both capital assets and human resources. However, owner-operator drivers in general are considered to be less loyal (the turnover is higher) and less cooperative and provide less customer satisfaction compared to the company-hired drivers. Although the owner-operators are considered as part of the capacity of those companies, they are different from the capacity provided by the company-hired drivers in terms of quality of service, dependability, consistency, risk-sharing properties and profitability.

Moreover, capacity utilization is crucial to the survival of a TL company. Since individual shippers usually do not require round trip service and individual drivers do not know all the routes equally well, high capacity utilization depends largely on a firm's ability to identify and organize demands of two or more shippers for individual trucks and trips, and to match an appropriate driver with the right trip and route. A TL company's dispatching staff constantly tries to allocate optimally the company's equipment and drivers, both company drivers and owner-operators, to the available loads, within a host of cost considerations. Since owner-operators are not employees of a trucking company, they have full discretion in accepting a job assignment (haul) and undertaking any activities to maximize the return from each job. The

company drivers, however, usually have much less discretion in picking the haul and selecting their routes and stops. The usage of owner-operators may present a variable in maximizing a trucking company's capacity utilization and labor productivity. The capacity decision between hiring company drivers and contracting with owner-operators in the TL firms, therefore, provide an opportunity to investigate whether labor productivity is related to the types of capacity.

HYPOTHESIS DEVELOPMENT

We argue that the information content of productivity measurements is related to MWA decisions. Generally, MWA can be a strategic decision of the production capacity modes, i.e., the soft capacity and hard capacity, which will not only affect the production cost behavior, but also the productivity, especially labor productivity. Labor productivity is an important performance measure that assesses the utilization of intangible assets such as human resources management practices which can be a source of sustained competitive advantage and can impact a firms' performance (Wright and McMahan 1992; Wright et al. 1994; Huselid 1995). MWA has a direct impact on the production capacity in many industries. In some cases, it not only affects the composition of direct labor used in production, it also affects the investment of production assets. These influences are reflected in the labor productivity measure.

From the production perspective, the main differences between soft capacity and hard capacity are in the levels of control, stability and flexibility. The hard capacity can provide higher levels of control and stability to the production of a company over the soft capacity while the soft capacity can increase a firm's flexibility in terms of product variety and production quantity.

Companies usually have better control over hard capacity because the company can give specific work instructions to the employees, make plans and arrangements for asset usage, monitor labor and asset utilization and make necessary adjustments and corrections. When companies use soft capacities such as independent contractors, they externalize administrative control over both the labor and the operating assets and do not make day-to-day work arrangements for the independent contractors. So it seems that a more stable production is related to the use of more homogeneous hard capacity because companies' internal labor market can increase employees' performance stability (Sorensen 1983), and companies' systematic asset management practice, e.g. scheduled maintenance, can decrease equipment breakdowns in the production process and therefore the variance of labor productivity.

However, it is also possible that the proportion of soft (hard) capacity used by a company can decrease (increase) the variance of labor productivity. For example, when companies with a high proportion of hard capacity face decreases (increases) in demand, they are less flexible to cut down (increase) their hard capacity immediately. This will result in a higher variance of labor productivity. So it follows that the variance in labor productivity is likely to be a function of companies' capacity choice, but whether the relationship is positive or negative is an empirical question. Therefore, we hypothesize the following:

Hypothesis 1: The variance in labor productivity changes with the proportion of soft capacity.

Some studies in the trucking industry suggest that employing company drivers can lead to high levels of asset utilization and therefore increase productivity and reduce operating expense (Corsi and Grimm 1989). However, as the authors point out, these findings should be interpreted with caution because possible confounding factors such as the technology are not controlled. Based on the following arguments, we suggest that compared to the companies with low levels of soft capacity, companies with high levels of soft capacity would have higher average labor productivity. First, the soft capacity offers companies a way to better match different production resources to different products' production requirements. For example, a trucking company can utilize its owner-operators more in the long-haul service since the owner-operators prefer long-hauls to short-hauls. As the soft capacity is arranged to specialize more in providing a specific product or service, there is a positive influence on the soft capacity's productivity. Second, based on the assumption that independent contractors are less risk averse than the average employee, it is less costly to motivate the independent contractors to work hard. In other words, given the same level of incentive, the independent contractors are more likely to exert more effort than the employees. These arguments suggest that the average labor productivity is likely to be a positive function of companies' capacity choices since soft capacity is likely to allow specialization and the entrepreneur motivation. We, therefore, make the following hypothesis:

Hypothesis 2: The average labor productivity of companies increases with the levels of soft capacity.

DATA AND RESEARCH METHODOLOGY

We begin with all 12069 observations of 3769 trucking companies that filed Motor Carrier Financial & Operating Information with the Federal Motor Carrier Safety Administration (FMCSA) from 1999 to 2003. Federal regulation requires all trucking companies with adjusted annual operating revenue over $3 million to file this report annually. Until 2003, the FMCSA made the data available in electronic form. Since 2004, the data is collected is but is no longer available in electronic form. The FMCSA collects financial data such as balance sheet and income statement data along with operating information such as tonnage, mileage, employees and transportation equipment. All motor carriers are required to use Generally Accepted Accounting Principles in reporting their financial data and they are required to follow specific guidelines in reporting their financial and operating information.

We select all the truckload firms from the 3769 trucking companies. A total of 6513 observations of 2167 firms are included in the initial sample. The range of sales revenue of these firms is between 3 million to over 2 billion dollars. In order to make the sample firms more

comparable, we exclude 5707 observations of 1875 firms that have less than 30 million in sales revenue from the sample.

Table 1 Sample Selection Criteria for Analysis from Year 1999-2003 and Descriptive Statistics

Panel A: Sample Selection Procedure

Full Sample	# of Obs	# of firms
Firms in the Motor Carrier Financial & Operating Information	12069	3769
Exclusion of firms that are not in the truckload (TL) segment	5556	1602
Exclusion of firms that have less than 30 million dollars of sales revenue	5707	1875
Exclusion of firms that do not have 4 or more consecutive years records	336	192
Exclusion of firms that are NFH, LTL or have errors	91	19
Total:	379	81

NFL= Not for hired, LTL= Less than truckload.

Panel B: Descriptive Statistics for all variables tested in the TL Carriers Samples

Variables	Mean	Median	Minimum	Maximum	Std Dev
SCR (n=379)	0.282	0.1617	0	1	0.308
TRAC (n=377)	839.3024	314	0	10649	1547
CID (n=271)	0.0644	0.0388	-0.5683	1.1158	0.1751
PROD (n=344)	98918	99149	26110	204271	26775
TRL (n=370)	2.0819	2.0162	0	8.2513	1.1285
MSS (n=375)	0.1544	0.0745	0.0137	0.9397	0.1769
WAGES (n=361)	35472	36598	0	62162	11928
PTR (n=375)	0.0737	0.013	-0.0024	0.8372	0.128
VPROD (n=260)	151399233	33282910	21812.87	5161606684	394091420
LSCR (n=297)	0.2874	0.1802	0	1	0.3072
CWPD (n=279)	0.0311	0.0158	-0.5257	0.9521	0.1572
CRPM (n=263)	0.0304	0.0274	-1.3532	1.2341	0.1916
CTND (n=298)	69.31	6.3489	-1424	6058	430.37

The 30 million sales revenue cutoff point is selected for two reasons. First, according to the American Trucking Association, firms with sales revenue of less than thirty million are considered to be small trucking companies. Second, the smallest sales revenue of a public trucking company reported in the sample is about $31 million dollars. To control for the possibility of unusual management behavior and firm performance due to bankruptcy or

takeover, we removed 336 observations of 192 firms that do not have at least four consecutive years of records in the sample. We further dropped 9 firms that are private carriers or semi-private carriers, 1 truck-rental firm, 1 less-than-truckload trucking firm, and 6 firms that have errors in their operating information. We also consolidate the records of 3 subsidiaries into one for the analysis. Since the US DOT has not been very strict in enforcing its reporting requirement, some carriers only report limited data. We adopted the following remedies for missing data. First, in order to maintain internal consistency, we use related information from the same firm-year report to compute or estimate the missing data for 6 firm-year observations. Second, for the publicly-traded carriers, we fill out some of the missing information of 17 firm-year observations from their corresponding annual financial reports 10-K and Other Definitive Proxy Statements Def-14A. Since our hypotheses require different sets of variables, we kept the firm observations that have all variables for at least one hypothesis testing. Finally, in order to remove the effects of outliers from the data, we drop observations with the highest and lowest 0.5 percent of the values for each variable in each year (Kothari and Zimmerman 1995). The final sample includes 379 observations of 81 firms. The sample selection procedures are summarized in Table 1.

RESEARCH METHODOLOGY

To test whether the variance of labor productivity of TL carriers is affected by the proportional use of soft capacity, we estimate the following regression model across all TL carriers for H1:

$$VPROD_{it} = \alpha_t + \beta_1 SCR_{it} + \beta_2 LSCR_{it} + \beta_3 CID_{it} + \beta_4 CTND_{it} + \beta_5 CWPD_{it} + \beta_6 CRPM_{it} + \beta_7 TRL_{it} + e_{it}, \quad (1)$$

where
i = trucking company index;
t = year index for 1999 to 2003;
VPROD = variance in labor productivity, measured by the square of changes in average labor productivity, which is the change in the average miles driven by a driver;
SCR = the soft capacity ratio, total number of owner-operators scaled by the total number of drivers (both owner-operators and company drivers);
LSCR = the lagged SCR; (SCR = total number of owner-operators scaled by the total number of drivers)
CWPD = the change in average wages per company driver;
CTND = the change in the total number of drivers
CRPM = the change in average revenue per mile;
CID = changes in total miles driven;
TRL = the average number of trailers available per driver;
e = error term.

The coefficient of interest is β_1, in model 1. We expect that the coefficient is significantly different from zero if the variance of productivity is associated with the levels of soft capacity used by a carrier. In general, the variance of labor productivity is assumed to be related to the change in market demand (Lenz and Bricker 1983), and the change in the quantity of labor (CTND). However, factors such as operation strategies (Corsi and Grimm 1991), financial incentives (Durant et al 2006) and capital substitution (Dupuy and de Grip 2006) also affect the variance of labor productivity.

CID and CTND are included to control for differences in the change in demand of the carriers and the change of the number of drivers. We do not make a prediction for the coefficients on CID and CTND because the changes in demand and number of drivers can be either positive or negative. So even the magnitude of CID and CTND may be positively related to the variance, whether the coefficients are positive or zero is an empirical question.

SCR is a measurement of the proportion of soft capacity we use to test our hypothesis. As we discussed in the section of hypothesis development, the influence of the levels of SCR on the variance of labor productivity can be either positive or negative, therefore, we do not make a prediction for the coefficient on SCR. Although there may exist a non-linear relationship between the variance of labor productivity and the levels of SCR, we do not consider that special functional form in this exploratory study.

LSCR is included to control for the difference in the lagged soft capacity. Together with the current soft capacity, the LSCR also provides information about the change in SCR. We do not make a prediction for this coefficient because it can be either positive or negative.

CWPD is included to control for the differences in the change of average wages per company driver. The level of average wages per company driver can be a proxy of the effectiveness of the carriers to manage and motivate their employees to work and therefore is negatively associated with the variance of labor productivity. We do not make a prediction for the coefficient on CWPD because the change can be either positive or negative.

CRPM is included to control for the differences in the change of market position and operating strategies among the carriers. We do not make a prediction for the coefficient on CRPM because on one hand, the higher the revenue generated per mile, the more value added by carrier on average. It is more likely that carriers need to provide consistent services through more efficient management of their production resources to control the variability in the overall performance of its drivers. On the other hand, if only the owner-operators in companies can reap the benefits from the higher revenue generated per mile, and the rest of the drivers do not share the benefit, the high CRPM will create a differential motivation effect on owner-operators and company drivers, and therefore can be associated with a high level of variance in labor productivity.

TRL is included to control the degree of substituting labor with capital in carriers' operations. The coefficient on TRL should be negative if the number of trailers available per driver can make the drivers' performance become more uniform across both company drivers and owner-operators.

To test whether the average labor productivity of the firms increases with the proportion of soft capacity, we estimate the following regression model across all TL carriers for H2:

$$PROD_{it} = \alpha_t + \beta_1 SCR_{it} + \beta_2 TRL_{it} + \beta_3 MSS_{it} + \beta_4 WAGES_{it} + \beta_5 ASSETS_{it} + \beta_6 PTR_{it} + \beta_7 TRAC + e_{it}, \quad (2)$$

where
i = trucking company index;
t = year index for 1999 to 2003
PROD = the average labor productivity, average ton miles driven by a driver;
SCR = the soft capacity ratio, total number of owner-operators
scaled by the total number of drivers (both owner-operators and company drivers);
TRL = the average number of trailers available per driver;
TRAC = the number of tractors owned or leased by a carrier at the beginning of the period;
WAGES= the average wages per company driver
PTR = the purchased transportation services from the third parties;
ASSETS = the natural log of total assets;
MSS = market share of a firm in the state where its primary operation is located;
e = error term.

TRL is included to control the degree of substituting labor with capital in carriers' operations. The coefficient on TRL should be positive if the number of trailers available per driver can decrease the drivers' down time and increase their driving hours on the road.

TRAC is included to control for the differences in the production capacity available for the company drivers. We expect this coefficient to be negative because if a carrier has more tractors, they will have more company drivers. This variable can provide information about the level of standard employees in MWA, while the SCR can provide the proportion of owner-operators in MWA. Since the number of tractors available can also represent the amount of spare equipment available for the company drivers, the bigger the base of tractors, the better support the company drivers can get to improve their productivity. In other words, the negative impact of TRAC on PROD may be offset by the positive impact; therefore we do not expect the coefficient to be of much practical significance.

WAGES is included to control for differences in company drivers financial incentives to work. We expect this coefficient to be positive. Although the effect of diminishing marginal utility of financial incentives may influence company drivers' motivation, the nonlinear impact of financial incentives on labor productivity is not modeled in this study.

ASSETS is included to control for the differences in size of the carriers. We expect this coefficient to be positive because large companies usually have more resources and better infrastructure to support their employees. For example, large companies can improve their labor productivity by optimizing both load assignments and trailer usage among their large numbers of drivers and trailers through their sophisticated dispatching technology and systems. The effect of diseconomies of scale is not considered in the model.

PTR is included to control for the effects of different levels of outsourcing on labor productivity. We expect the coefficient on PTR to be positive because if the external party can provide more efficient and productive transportation service than the carrier, then the carrier would prefer outsourcing to in-house production. The carrier will keep depending on outsourcing until the marginal productivity of both outsourcing and in-house-production become the same. In other words, we expect the labor productivity should be at least as good as the external parties. So we expect that the more purchased transportation from external parties, the higher the internal labor productivity on average. MSS is included to control for the difference in market share of the carriers. It is the sales of the sample carrier divided by the total sales reported in the same state as the sample carrier is located. We expect the coefficient on MSS to be negative because on average the larger the carrier's market share then, generally, the carrier serves more customers. Supply of heterogeneous services, in general, has a negative impact on productivity. Also, carriers with large market share may have relatively high production slack which may drive down the average labor productivity.

EMPIRICAL RESULTS

We first discuss the univariate analysis and then the multiple regression results of individual hypothesis. Table 2 presents details on correlations among all the variables used in the analysis of the impact of the levels of the soft capacity ratio on the variance and level of labor productivity (H1 and H2). It shows that among all the independent variables, only CID and TRL are significantly correlated with the VPROD. As expected, TRL is negatively and significantly correlated with VPROD ($\rho = -0.1366$) while CID is positively and significantly correlated with VPROD ($\rho = 0.1644$). The correlation between CRPM and VPROD is almost zero ($\rho = 0.0014$). It suggests that the operating strategy may not affect the variance of labor productivity. Both SCR and LSCR are positively correlated with VPROD, but not significantly. Both CWPD and CTND are negatively correlated with the VPROD, but not significantly.

The correlations between CTND, CWPD and CID are significant at the 0.05 level, while CID and CRPM are significantly negatively correlated ($\rho = -0.5683$) at less than the 0.01 level. Also, SCR and LSCR are positively and significantly correlated at less than the 0.01 level ($\rho = 0.9893$). The results suggest that multicollinearity is a concern in the multiple regression analysis. Overall, the correlations between the independent variables and VPROD do not provide preliminary support for H1.

The correlations between CTND, CWPD and CID are significant at the 0.05 level, while CID and CRPM are significantly negatively correlated ($\rho = -0.5683$) at less than the 0.01 level. Also, SCR and LSCR are positively and significantly correlated at less than the 0.01 level ($\rho = 0.9893$). The results suggest that multicollinearity is a concern in the multiple regression analysis. Overall, the correlations between the independent variables and VPROD do not provide preliminary support for H1.

Table 2: Sample Correlations: Variables tested in Hypothesis 1 and Hypothesis 2													
	PROD	SCR	TRL	MSS	WAGES	ASSETS	TRAC	PTR	VPROD	CID	CWPD	CRPM	CTND
PROD													
SCR	0.1846												
sig	-0.0006												
n	344												
TRL	0.0630	-0.1356											
sig	-0.2460	-0.0090											
n	341	370											
MSS	-0.1865	-0.0527	0.1078										
sig	-0.0005	-0.3086	-0.0393										
n	341	375	366										
WAGES	-0.0224	-0.4697	0.1106	0.0586									
sig	-0.6841	0.0000	-0.0364	-0.2696									
n	334	361	358	357									
ASSETS	0.0206	-0.2932	0.1642	0.5030	0.1571								
sig	-0.7052	0.0000	-0.0017	0.0000	-0.0030								
n	341	373	364	369	355								
TRAC	0.0639	-0.0441	-0.0018	0.0487	0.0191	0.6568							
sig	-0.2383	-0.3936	-0.9730	0.0000	-0.7181	0.0000							
n	342	377	368	373	359	371							
PTR	-0.0487	-0.0372	0.1103	0.1848	0.2494	0.2494	0.0663						
sig	-0.3710	-0.4733	-0.0348	-0.0003	0.0000	0.0000	-0.2016						
n	340	375	366	371	357	357	373						
VPROD	-0.0265	0.0364	-0.1366	-0.0654	-0.0529	-0.0905	-0.0725	0.0372					
sig	-0.6710	-0.5579	-0.0277	-0.2961	-0.4025	-0.1471	-0.2460	-0.5532					
n	259	261	260	257	253	258	258	257					
CID	0.0364	0.0219	-0.1115	0.0367	0.0581	-0.0576	-0.0592	-0.0404	0.1644				
sig	-0.5572	-0.7193	-0.0685	-0.5505	-0.3498	0.3469	-0.3332	-0.5111	-0.0078				
n	263	271	268	267	261	269	269	267	261				
CWPD	0.1188	0.0582	0.0562	-0.0407	0.2197	-0.0307	-0.0324	0.0224	-0.0685	0.1250			
sig	-0.0571	-0.3332	-0.3504	-0.5017	-0.0002	-0.6121	-0.5919	-0.7118	-0.2806	-0.0449			
n	257	279	278	275	277	275	277	275	250	258			
CRPM	-0.1143	-0.0503	0.0544	0.0402	0.0335	0.0784	0.0284	0.0935	0.0014	-0.5683	-0.0583		
sig	-0.0673	-0.4171	-0.3828	-0.5196	-0.5957	-0.2083	-0.6481	-0.1327	-0.9824	0.0000	-0.3585		
n	257	263	260	259	253	261	261	260	257	263	250		
CTND	0.0134	-0.0757	-0.0071	0.3000	-0.0136	0.2886	0.1389	-0.0124	-0.0208	0.1796	-0.1338	0.0157	
sig	-0.8366	-0.1924	-0.9040	0.0000	-0.8188	0.0000	-0.0168	-0.8323	-0.7381	-0.0030	-0.0254	-0.7995	
n	241	298	293	294	285	294	296	294	260	271	279	263	
LSCR	-0.1720	0.9893	-0.0794	-0.0455	-0.4624	-0.2854	-0.0368	-0.0377	0.0425	0.0045	0.0369	-0.0322	-0.0663
sig	-0.0076	0.0000	-0.1761	-0.4380	0.0000	0.0000	-0.5290	-0.5204	-0.4958	-0.9411	-0.5402	-0.6044	-0.2548
n	240	297	240	293	284	293	295	293	259	270	278	262	297

Variable Definitions:
VPROD = variance in labor productivity, measured by the square of changes in average labor productivity, which is the change in the average miles driven by a driver; SCR = the soft capacity ratio, total number of owner-operators scaled by the total number of drivers (both owner-operators and company drivers); LSCR = the lagged SCR; CWPD = the change in average wages per company driver; CTND = the change in the total number of drivers; CRPM = the change in average revenue per mile; CID = changes in total miles driven; TRL = the average number of trailers available per driver; PROD = the average labor productivity, average ton miles driven by a driver; TRAC = the number of tractors owned or leased by a carrier at the beginning of the period; WAGES = the average wages per company driver; PTR = the purchased transportation services from the third parties; ASSETS = the natural log of total assets; MSS = market share of a firm in the state where its primary operation is located

As expected, SCR is significantly positively correlated with PROD (ρ = 0.1866). MSS is significantly and negatively correlated with the PROD (ρ = -0.1865), while all other control variables such as TRAC, WAGES, and PTR are negatively correlated with the PROD, but not significantly. TRL and ASSETS are positively correlated with PROD, but not significantly. Many correlations between the independent variables are significant. For example, the correlations between ASSETS and MSS (ρ = 0.5030), ASSETS and TRAC (ρ = 0.6568), MSS and TRAC (ρ = 0.4873), SCR and WAGES (ρ = -0.4697) are significant at the 0.01 level. The results suggest that multicollinearity is a concern in the multiple regression analysis. Overall, the significant positive correlation between SCR and PROD provides some preliminary support for H2.

In Panel A of Table 3, we present the OLS results for the pooled cross-sectional regression model presented in Equation (1), in which the variance in labor productivity is regressed on the soft capacity ratio, lagged soft capacity ratio, change in demand and change in number of drivers and other economic determinants. There are 243 firm-year observations used in estimation. The model is explanatory with an adjusted R^2 of 20.58%. The coefficient on SCR is negative. The results suggest that variance in labor productivity decreases 342.81 miles per driver as the proportion of soft capacity increases by 1 percent, holding other variables constant.

Table 3: Tests of Impacts of SCR on Productivity for the TL carriers

Panel A: Pooled cross-sectional OLS regressions of VPROD using 243 observations for 81 TL carriers in the period of 1999 – 2003

Model: $VPROD_{it} = \alpha_t + \beta_1 SCR_{it} + \beta_2 LSCR_{it} + \beta_3 CID_{it} + \beta_4 CTND_{it} + \beta_5 CWPD_{it} + \beta_6 CRPM_{it} + \beta_7 TRL_{it} + e_{it}$, (1)

	Variables	Predicted Sign	Coefficient Estimates	t-statistic	p-value[a]
	INTERCEPT		120055692	2.25	0.0256
	SCR	?	-1.175E+09	-2.08	0.0384
	LSCR	?	1.232E+09	2.18	0.0303
	CID	?	897430145	4.96	0
	CTND	?	-83747	-1.7	0.0906
	CWPD	?	93685862	0.66	0.5073
	CRPM	?	-327668403	-2.22	0.0277
	TRL	-	-26110918	-1.41	0.0795
	Adj. R^2		0.2058		0
	No. of Obs.		243		

[a] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.
Variable Definitions: VPROD is the variance in labor productivity, measured by the square of changes in average labor productivity, which is the change in the average miles driven by a driver. SCR is the soft capacity ratio, the total number of owner-operators scaled by the total number of drivers (both owner-operators and company drivers). LSCR is the lagged SCR. CWPD is the change in average wages per company driver. CTND is the change in the total number of drivers. CRPM is the change in average revenue per mile.CID is changes in total miles driven. TRL is the average number of trailers available per driver.e is the error term.

Panel B: Cross-sectional regressions of VPROD by year for the period of 1999 – 2003
OSL estimation: Model: $VPROD_i = \alpha_t + \beta_1 SCR_i + \beta_2 LSCR_i + \beta_3 CID_i + \beta_4 CTND_i + \beta_5 CWPD_i + \beta_6 CRPM_i + \beta_7 TRL_i + e_i$, (1)

Table 3: Tests of Impacts of SCR on Productivity for the TL carriers					
Year	Variables	Predicted Sign	Coefficient Estimates	t-statistic	p-value[a]
2000	INTERCEPT		56690595	0.95	0.3453
	SCR	?	-2.234E+09	-4.51	0
	LSCR	?	2.195E+09	4.54	0
	CID	?	105329390	0.53	0.5984
	CTND	?	-47752.5	-1.03	0.3081
	CWPD	?	-110746057	-1.04	0.3025
	CRPM	?	727890072	2.09	0.0426
	TRL	-	-5523205	-0.38	0.3547
	Adj. R^2		0.4383		
	No. of Obs.		50		
[a] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.					
Panel B: Cross-sectional WLS regressions of VPROD by year for the period of 1999 – 2003 WLS Estimation: Model: $VPROD_i = \alpha_t + \beta_1 SCR_i + \beta_2 LSCR_i + \beta_3 CID_i + \beta_4 CTND_i + \beta_5 CWPD_i + \beta_6 CRPM_i + \beta_7 TRL_i + e_i$, (1)					
Year	Variables	Predicted Sign	Coefficient Estimates	t-statistic	p-value [a]
2001	INTERCEPT		294296100	2.66	0.0106
	SCR	?	-3.843E+09	-2.62	0.0116
	LSCR	?	3.842E+09	2.64	0.0111
	CID	?	-152896982	-0.33	0.7421
	CTND	?	-363633	-1.17	0.2483
	CWPD	?	-981775744	-2.22	0.0313
	CRPM	?	-162592573	-0.28	0.7789
	TRL	-	-59234060	-1.54	0.0655
	Adj. R^2		0.1749		
	No. of Obs.		58		
2002	INTERCEPT		2789768	0.08	0.9379
	SCR	?	1.187E+09	2.33	0.0236
	LSCR	?	-1.036E+09	-2.1	0.0409
	CID	?	235824572	1.74	0.0868
	CTND	?	-6992.84	-0.27	0.7886
	CWPD	?	699536347	3.56	0.0008
	CRPM	?	-121050377	-0.99	0.3244
	TRL	-	31364562	2.26	0.014
	Adj. R^2		0.318		
	No. of Obs.		61		
2003	INTERCEPT		-98989764	-1.43	0.1632
	SCR	?	-3.093E+09	-2.06	0.0471
	LSCR	?	3.196E+09	2.14	0.0404
	CID	?	1.632E+09	3.25	0.0027
	CTND	?	-37533	-0.15	0.8834
	CWPD	?	-826255888	-2.59	0.0143
	CRPM	?	-339534702	-0.9	0.3726
	TRL	-	31270860	0.8	0.7839
	Adj. R^2		0.2395		
	No. of Obs.		40		
[a] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.					

Table 3: Tests of Impacts of SCR on Productivity for the TL carriers

Panel C: Pooled cross-sectional OLS regressions of PROD using 321 observations for 81 TL carriers in the period of 1999 – 2003
Model: $PROD_{it} = \alpha_t + \beta_1 SCR_{it} + \beta_2 TRL_{it} + \beta_3 MSS_{it} + \beta_4 WAGES_{it} + \beta_5 ASSETS_{it} + \beta_6 PTR_{it} + \beta_7 TRAC + e_{it}$, (2)

Variables	Predicted Sign	Coefficient Estimates	t-statistic	p-value [a]	
INTERCEPT		-34603	-1.17	0.2445	
SCR	+	26045	4.75	0	
TRL	+	1395.03	1.1	0.137	
MSS	-	-32788	-3.05	0.0012	
WAGES	+	0.1735	1.25	0.1067	
ASSETS	+	7242.3	4.19	0	
PTR	+	9102.54	0.74	0.2289	
TRAC	-	-3.0815	-2.49	0.0068	
Adj. R^2		0.1062			
No. of Obs.		321			

[a] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.

Panel D: Pooled cross-sectional OLS regressions of PROD using 165 observations for 31 TL carriers in the period of 1999 – 2003
Model: $PROD_{it} = \alpha_t + \beta_1 SCR_{it} + \beta_2 TRL_{it} + \beta_3 MSS_{it} + \beta_4 WAGES_{it} + \beta_5 ASSETS_{it} + \beta_6 PTR_{it} + \beta_7 TRAC + e_{it}$, (2)

Variables	Predicted Sign	Coefficient Estimates	t-statistic[a]	p-value[b]	
INTERCEPT		-65893.8	-1.19	0.2349	
SCR	+	18421.08	2.06	0.0206	
TRL	+	10547.56	4.86	0	
MSS	-	-36488.7	-2.72	0.0036	
WAGES	+	0.5397	2.55	0.0059	
ASSETS	+	7283.26	2.49	0.007	
PTR	+	24190.5	0.66	0.2536	
TRAC	-	-3.2525	-1.6	0.0557	
Adj. R^2		0.3746			
No. of Obs.		165			

[a] All t-statistics are based on Newey and West's (1987) heteroscedasticity and autocorrelation consistent standard error estimates
[b] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.

Table 3: Tests of Impacts of SCR on Productivity for the TL carriers					
Panel D: Cross-sectional OLS Regression of PROD by Year Model: $PROD_i = \alpha_t + \beta_1 SCR_i + \beta_2 TRL_i + \beta_3 MSS_i + \beta_4 WAGES_i + \beta_5 ASSETS_i + \beta_6 PTR_i + \beta_7 TRAC_i + e_i$					
Year	Variables	Predicted Sign	Coefficient Estimates	t-statistic	p-value [a]
1999	SCR	+	5201.59	0.39	0.351
	TRL	+	2475.14	0.6	0.275
	MSS	-	-68793	-3.94	0.0002
	WAGES	+	0.02	0.04	0.4828
	ASSETS	+	10582	2.81	0.0037
	PTR	+	-20751	-0.9	0.1865
	TRAC	-	-3.04	-1.16	0.1266
	Adj. R^2		0.2876		
	No. of Obs.		52		
2000	SCR	+	20925	1.69	0.0484
	TRL	+	2274.6	0.82	0.2081
	MSS	-	-10664	-0.36	0.3603
	WAGES	+	0.26	0.77	0.2228
	ASSETS	+	8131.47	2.05	0.0221
	PTR	+	6750.43	0.27	0.3944
	TRAC	-	-4.59	-1.38	0.0868
	Adj. R^2		0.0137		
	No. of Obs.		71		
2001	SCR	+	26244	2.22	0.0152
	TRL	+	288.6	0.11	0.4559
	MSS	-	-48711	-2.3	0.0125
	WAGES	+	0.16	0.54	0.2961
	ASSETS	+	10065	2.74	0.004
	PTR	+	24977	1.05	0.1478
	TRAC	-	-3.68	-1.42	0.0799
	Adj. R^2		0.0813		
	No. of Obs.		71		
2002	SCR	+	36024	3.07	0.0017
	TRL	+	3317.65	1.09	0.1409
	MSS	-	-49650	-2.75	0.004
	WAGES	+	0.12	0.41	0.3417
	ASSETS	+	4703.4	1.35	0.0915
	PTR	+	25187	0.68	0.2501
	TRAC	-	-1.36	-0.48	0.3151
	Adj. R^2		0.1418		
	No. of Obs.		68		
2003	SCR	+	51174	3.17	0.0013
	TRL	+	-1557.11	-0.49	0.3135
	MSS	-	-30449	-1.27	0.1058
	WAGES	+	0.29	0.82	0.209
	ASSETS	+	7167.23	1.65	0.0526
	PTR	+	90509	2.03	0.024
	TRAC	-	-5.01	-1.45	0.0764
	Adj. R^2		0.1441		
	No. of Obs.		57		
[a] All p-value are based on one-tailed t-tests when the coefficient sign is predicted, and based on two-tailed t-tests otherwise.					

However, the White's (1980) tests indicate specification and / or heteroscedasticity problems in the sample at less than the 0.05 and 0.01 level (Chi-Square = 50.77 and 225.6). On top of the heteroscedasticity, the error terms in the OLS are also likely to be autocorrelated. As a result, estimation of the standard errors of the estimators in the OLS regression is biased, and the inferences from the F-test or t-tests may be misleading.

To mitigate the influence of heteroscedasticity and autocorrelation, we perform an additional OLS estimation based on a sub-sample. From the original 243 firm-year observations sample, we can only select 34 carriers, a total of 136 firm-year observations that have complete data from 2000 to 2003 for further analysis. The model is not explanatory with an adjusted R^2 of 2.71%. Except for the CID, none of the other independent variables is significantly different from zero at the 0.05 level. Overall, the regression model does not describe the sub-sample well.

However, the cross-sectional regressions by year show that the proportion of independent contractors of a carrier's production capacity has significant explanatory power to the variance of labor productivity of the TL carriers in all four years. The results provide support for the hypothesis that the variance of labor productivity changes with the proportion of soft capacity used by a carrier.

Panel B of Table 3 reports the OLS and the WLS results for the cross-sectional regression model of Equation (1) by year. All cross-sectional regressions models by year are explanatory. The adjusted R^2 for 2000, 2001, 2002 and 2003 are 43.83%, 17.49%, 31.80% and 23.95% respectively. Except for the year 2001, the White's tests do not indicate the presence of heteroscedasticity. The coefficients of SCR in 2000, 2001 and 2003 are negative and significant (t-statistics = -4.51, -2.62 and -2.06 respectively), while it is positive and significant (t-statistics = 2.33) in 2002. At the same time, the coefficients on TRL in 2000, 2001 and 2003 are negative but not significant, and it is positive and significant in 2002. The inconsistent signs of SCR and TRL in 2002 suggest that the carriers' performance in 2002 may be systematically different from other years since the trucking industry started to recover from its depression in 2002. Overall, the results indicate that the effect of SCR on the variance of labor productivity is negative. These results provide consistent evidence for the association between the variance in labor productivity and the proportion of soft capacity. The inconsistent findings between the pooled regression on the sub-sample and the cross-sectional regression by year may be caused by insufficient power to detect the effect.

In Panel C of Table 3, we present the OLS results for the pooled cross-sectional regression model presented in Equation (2), in which levels of labor productivity are regressed on the levels of the soft capacity ratio and other economic determinants across 321 carriers in the sample. The regression is explanatory with an adjusted R^2 of 10.62%. All coefficients have the expected signs. The coefficient on SCR is positive. However, the White's (1980) tests again indicate the presence of specification and / or heteroscedasticity problems in the sample at less than the 1% level (Chi-Square = 58.19 and 164.5) and therefore the estimates of the standard errors are likely to be biased.

In order to mitigate the inference problems caused by heteroscedasticity and potential autocorrelations in the sample, we perform an additional analysis based on a sub-sample and report t-values based on Newey and West's (1987) heteroscedasticity and autocorrelation corrected covariance estimates in the Panel D Table 3. From the original 321 firm-year observations sample, we select 51 carriers that have complete data from 1999 to 2003, a total of 208 firm-year observations, for analysis. The regression model is explanatory with an adjusted R^2 of 37.46%. All coefficients have the expected signs. All, except PTR and TRAC, are significant at the 0.05 level or better. As expected, the coefficient on SCR is significantly positive (t-statistic = 2.06). The results suggest that labor productivity increases 184.21 miles per driver as the proportion of soft capacity increases by 1 percent, holding other variables constant. Overall the OLS pooled regression results provide support to H2 that the average labor productivity of companies increases with the levels of soft capacity. The proportion of soft capacity (SCR) has significant explanatory power to the level of labor productivity among the TL carriers. The cross-sectional regressions by year, except for the year 1999, provide consistent results to support the conclusion. Panel D of Table 3 reports the WLS results for the cross-sectional regression model of Equation (2) by year. The White test for heteroscedasticity is no longer significant in the estimations of these five years. The regression model estimations of 1999, 2002 and 2003 are significant at the 0.05 level. The regression model estimation for 2001 is of marginal significant (F-statistics = 1.89, p-value = 0.0869). Consistent with the results in Panel A, SCR is positively associated with PROD in 2001, 2002 and 2003 at less than the 0.05 level. SCR is positive but not significant in 1999. It is positive and significant in 2000, but the regression model is not significant explanatory (F-statistics = 1.14, p-value = 0.3506). The coefficients on all independent variables maintain the same expected signs as in the pooled regression in all five years except TPD and PDR in 2003 and 1999. Overall, the cross-sectional regression by year provides consistent support to H2 that the average labor productivity of companies increases with the levels of soft capacity.

CONCLUSION

This study investigates the impact of the proportion of soft capacity (SCR) used in operations on the level and variance of labor productivity. We find that the proportion of the soft capacity deployed by the TL carriers is significantly and positively associated with the levels of labor productivity. Our results are in contrast to the prior studies of the TL trucking industry, which suggest that productivity is positively associated with employing company drivers. Our evidence is consistent with our argument that owner-operators are more motivated to work hard because they are less risk averse and more sensitive to pay-for-performance, and therefore the proportion of soft capacity is positively associated with the average labor productivity. We also find that the proportion of soft capacity is significantly associated with the variance in labor productivity. Results from the cross-sectional regression tests by year are consistent with our

argument that the influence of the levels of the soft capacity ratio on the variance of labor productivity can be either positive or negative. Owner-operators can be less controllable and more heterogeneous than the company drivers; therefore, more variability is associated with their performance. But at the same time, owner-operators may decrease the variance in the labor productivity because they provide the carriers the flexibility to face fluctuations in the demand. In other words, as customers demands fluctuate, the carrier can effectively meet the customer needs with soft capacity (owner-operators).

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BANKING ON STUDENTS

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ABSTRACT

This paper describes the creation of a new sequence of elective banking courses developed by a team of faculty members and senior officers from the local banking community. These officers represent local, regional, and super-regional financial institutions. The course content was organized to better prepare finance and economic students for careers in banking.

The program uses active learning processes to develop critical thinking while acquiring skills specific to a given career. The first course is taught in a traditional lecture format and serves as a prerequisite for the other courses. The second course is experiential in nature; class meetings are held in different bank offices and are led by an officer from that bank. The class meetings have predetermined topics and the banker leading the class is expected to discuss not only theory but application and examples drawn from personal experience. The second course also models real-world experience through the use of a bank simulation in which students groups direct their own bank in competition with other students. The final course in the sequence is a formal summer internship modeled after the employee training programs that each bank provides its own employees.

INTRODUCTION

It all started over dinner. Greg Gonzales, the Tennessee Commissioner for Financial Services (and an alumnus of Tennessee Tech) had been on campus in early October 2007 to speak to classes about the current state of banking and financial services. We were finishing the day with dinner at a local restaurant. Over pasta, we discussed the significant number of our students that enter the banking and financial services industry upon graduation and how the current TTU curriculum offered only a single elective banking course. Greg wondered aloud if that was enough; after further discussion, we decided that more needed to be done. That left us with figuring out how to do it.

ACADEMIC ISSUES

Was adding yet another course that provided more rigorous focus on maximizing shareholder value something that was in the best interests of our students? Would local banks find those skills most valuable, or was there something else? In thinking about how to best prepare our students, we even began to doubt what we considered "learning". The students we

had in mind had already accumulated credit hours in the course Money and Banking (Econ 3320), a course required of all business students that provides an overview of the U.S. financial system and a second course, Commercial Banking (FIN 4610), a senior finance elective focusing on commercial bank operations. In thinking about the next best course for our students, we began to realize that these students were not "blank slates" upon which we could write additional knowledge. These students were going to bring their own backgrounds and experiences to the course, and we would essentially be altering what was already on the slate.

Our thoughts about this possible new direction in our curriculum were part of changes that were already happening at TTU and on many other college campuses. Several years ago, as part of the accreditation process by the Southern Association of Colleges and Schools (SACS), Tennessee Tech University was required to produce a Quality Enhancement Plan (QEP). After a lengthy process of defining its vision and mission, the university examined a large collection of assessment data, and identified several areas of weakness.

One area of assessment involved surveys of employers to identify what skills they thought were important, and if our students demonstrated competency in those skills. The surveys revealed that the five most important skill areas for employers were problem solving, communication, teamwork, learning skills, and critical thinking. This was more generally confirmed in later research by Rutgers University for the New Jersey Higher Education Commission, which revealed that employers of those with bachelor's degrees consider critical thinking and problem solving to be two of the five most important factors for success in employment. Employers were then asked to rate the abilities of our students. They rated our students very highly for teamwork, ethics, and technical skills. The three areas where our students seemed to score lowest were communication, critical thinking, and problem solving.

It was glaringly obvious that although employers gave our students high ratings for their technical skills, those skills were not important to employers. Even more obvious was that faculty members were apparently unaware of this discrepancy. TTU uses the IDEA teaching evaluation system developed at Kansas State University in formal student evaluation of instruction. Because of the diversity of courses offered by the university, not all courses have the same objectives. In order to accommodate these differences, the course objectives are selected by instructors. Over 60% of faculty chose "gaining factual knowledge", "learning principles or theories", and "learning to apply course material" as their essential or important objectives for their courses. Less than a third chose "teamwork", "communication", or "critical thinking".

Another part of the assessment was to compare our students with those at other universities. The administration of the National Survey of Student Engagement (NSSE) revealed that, at least in the minds or our students, our courses emphasized memorization and rote retention of factual information significantly more often than those at comparable institutions. We were also lower than the national average in our contribution to effective communication skills and in student contributions to the welfare of our communities. Anecdotal evidence from focus groups with our faculty led to the conclusion that our students have trouble with

transferring knowledge to problem-solving, critically evaluating information, dealing with complex real-world problems, and creating approaches to new problems.

Using these results, TTU developed its QEP. The plan called for improving students' critical thinking/real-world problem solving skills through the use of active learning strategies with emphasis on communication skills, teamwork skills, and creative thinking. To motivate faculty adoption and to monitor progress, the University initiated a program of small grants to facilitate course redesign and implementation. In addition, the outstanding QEP at the University is recognized annually.

We began to explore the possibility of using active learning in our new courses. Many of us open our lectures with the statement that management is part science and part art. We then proceed to teach our courses as if business is totally science. Management courses tend to be text-driven and discursive; the knowledge is presented in a linear sequence. Almost all of the time spent in management courses is about conveying information, the exception being exams and papers in which students demonstrate how much of the conveyed information they have retained. Art courses, on the other hand, are experiential in nature, not text-driven. Art courses tend to spend most of their time on student expression and demonstrated skills. The learning is active rather than passive, and has a repetitive, recursive, component.

In order for active learning to improve our students' ability to think critically, communicate effectively, think creatively, and solve real-world business problems, then the learning environment must closely resemble the application environment (Bransford et.al., 2000). Effective strategies for classroom active learning include problem-based learning, simulations, case-based learning, and service learning (Braun, 2004; Muir, 1996; Springer and Borthick, 2004). Active learning has also been shown to improve student motivation (Cheung, Rudowicz, Kwan, and Yue, 2002). But before choosing which of these active learning strategies would be appropriate and how to include them in the course, we decided to consult with members of the banking community.

BANKER DISCUSSIONS

The Tennessee Tech University College of Business Mission Statement emphasizes creative teaching and learning techniques, applies scholarly inquiry to real business questions, and provides service to the profession. To better accomplish our mission, we seek to involve our constituents in these endeavors. As we began the process of augmenting our banking curriculum, we turned to our local bankers.

The banking industry in Cookeville is highly fragmented with local branches of super-regional, regional, and banks headquartered in the Upper Cumberland. No one institution dominates the market. We are fortunate to have alumni and other constituents in management positions in all of the banks. Using this strength, we invited senior management from the institutions to a Friday lunch (delivered pizza, soda, and packaged cookies) meeting to discuss the current state of banking and, more importantly, the skill set required of people entering the

financial services field. The ultimate purpose of the meeting was to determine (1) if additional banking courses needed to be added to the curriculum (2) what subject areas needed to be included in the new courses, and (3) what other activities were needed to better prepare our students for employment in the banking industry.

Our first meeting took place in mid-November 2007. Surprisingly, senior managers from all twelve of the invited banks attended. We began by distributing a syllabus from the existing course and giving a brief overview of the course goals and desired outcomes. We then began the discussion of what else was needed.

The first major task was the clarification of the ultimate goal of the new course. The bankers agreed that the purpose of the additional course was to make the economics/finance major more attractive to the industry because of the specialized skill set gained from the class.

Another suggestion was to open the sequence of courses to all business majors. The bankers reminded us that the banking industry also hires students with accounting, information systems, marketing, and management backgrounds. The group agreed that this sequence would be a good way to attract those individuals to the industry.

One of the bankers suggested the use of a banking simulation as a primary component of the third course. Many of the attendees had attended the LSU Graduate School of Banking and unanimously agreed that the use of the simulation had greatly improved the learning process. The use of the simulation with lectures prepared by the bank managers was proposed as a way to add practical examples to the course. This incorporation also would provide problem solving and critical thinking opportunities for our students. We faculty members immediately recalled the QEP's recommendation of simulation use as a component of active learning.

A concern of several of the group was the need for a flexible and dynamic course to reflect current conditions in the marketplace. The group felt that this was paramount in the new course development given the changing nature of the industry. They believed that a "shell" of major areas of emphasis was the best way to accomplish this; the individual class meetings could reflect current situations in the areas of emphasis.

Unexpectedly, one of the bankers suggested that a formal 8-12 week summer internship program for additional experience would be desirable. The other bankers unanimously agreed; they offered to work together to develop a competitively awarded paid internship program at the represented banks. The internship program would allow students to observe and be a part of the different areas of the modern commercial bank including consumer, mortgage, and commercial lending, money management, etc. We have to admit that we did not envision their willingness to develop such a program; of course, we wasted no time in making the formal internship the fourth course in the sequence.

We met again with the group in February and April 2008. These meetings allowed the bankers to review, discuss, and suggest modifications for the new syllabi. It also gave us the opportunity to more closely tailor course goals to the desired skill set.

COURSE SEQUENCE

The resulting course sequence that we developed in concert with the bankers was the product of the series of lunch meetings, telephone conversations, and e-mails. We found that the process was dynamic rather than static; the third course and internship course materials and requirements were refined and augmented as the courses were offered. During the course design process, we applied for and received a QEP grant from the University (the QEP application may be found in Appendix 1).

The existing courses that serve as the starting point of the course sequence are Money and Banking and Commercial Banking. Our process with the bankers left these courses largely untouched. Money and Banking is offered each semester as part of the business core. Commercial Banking is offered in the fall semester as a senior-level finance elective. Before enrolling in Commercial Banking, students are required to complete the Money and Banking course. The students in the Commercial Banking course have typically been finance majors (with a few accounting majors) in their final year of study. This elective is a traditional commercial banking course including topics such as asset/liability management and management of sources and uses of funds

The first new course (the third course in the sequence) debuted in January 2009. As shown in the syllabus, the course was structured around the Banrisk Commercial Bank Simulation. The simulation uses student team financial decisions and randomly-selected economic conditions to generate bank operation outcomes. Students are required to set financial performance objectives, make operating decisions, and evaluate the outcomes from these decisions. The program emphasizes the interconnected relationship of decision outcomes and shows how the economic environment can affect financial performance. A typical class meeting consisted of a lecture by one of the banking executives on that week's simulation chapter (either on campus or at their bank), a review of the outcomes of previous simulation decisions, and the submission of the week's simulation inputs.

The initial round of formal internships was scheduled for May 2009. Following the financial meltdown, the bankers asked to postpone the formal program until May 2010. However, several of the banks hired summer internship students from the third class. This actually worked out better for the sequence since it allowed us to observe the students' progress through the initial internship schedule and make adjustments to better reach both the banks' and students' outcome goals. The course syllabi for the four courses may be found in Appendix 3.

OUTCOMES

Commercial Banking was offered during the fall semester 2008 on Wednesday evenings from 6-8:40 PM. This is the usual time slot for the course. 27 students enrolled in the course. The IDEA course evaluations were fairly consistent with past evaluations of the course; the

instructor overall rating was 4.2 (on a 5-point scale) as was the course rating. The average grade point for the course was 2.7, slightly lower than the individual student average of 2.8.

Advanced Commercial Banking was offered during the Wednesday night time slot during the spring semester 2009. Given the more specialized nature of the course, 10 students enrolled. The students were of higher academic quality (2.9 overall average GPA); the average GPA for the course was 3.8. It is interesting that two of the students were Korean exchange students spending the spring semester at TTU. The instructor overall rating was 4.5; the course rating was 4.0. Anecdotal evidence (from student comments) suggests that the higher instructor rating was due to the individual banking executive expertise in their lectures. The lower overall course evaluation was primarily due to the difficulty of implementing the Banrisk simulation for the first time. Table 1 shows the student GPA, course GPA, instructor IDEA rating, and course IDEA rating for Commercial Banking and Advanced Commercial Banking for the 2008-2009 academic year.

TABLE 1
STUDENT, COURSE, AND INSTRUCTOR GPA AND IDEA RATINGS
COMMERCIAL BANKING AND ADVANCED COMMERCIAL BANKING
2008-2009

	COMMERCIAL BANKING	ADVANCED COMMERCIAL BANKING
ENROLLMENT	27	10
STUDENT GPA (AVERAGE)	2.8	2.9
COURSE GPA AVERAGE	2.7	3.8
INSTRUCTOR IDEA RATING	4.2	4.5
COURSE IDEA RATING	4.2	4.0

As part of Tennessee Tech's QEP grant, the Center for Assessment & Improvement of Learning conducted a pre- and post-survey of student perceptions of critical thinking in the Advanced Commercial Banking Class. Students were given the baseline survey on the second meeting of the course and were asked to rank their perceptions of the "typical course" on 20 measures. The same questions were asked at the final class meeting, this time asking the students to rank their perceptions of "this course". Due to the proprietary nature of the survey and restrictions on research on human subjects, the complete survey instrument cannot be included in this paper. We therefore report survey results by category of question. Although the questions predominantly focus on critical thinking, they also rate problem solving, communication, and teamwork. Table 2 shows the pre- and post-course survey results by category of question.

As shown in Table 2, student answers changed (as measured by statistical significance) on only three of the twenty questions. The Center director and staff believe (and we concur) that

the lack of significant differences in the pre- and post-survey results were primarily the result of the nature of the survey questions. In addition, we believe that the students primarily rated the effectiveness of the simulation rather than the total experience of the overall course.

TABLE 2
STUDENT PERCEPTIONS OF CRITICAL THINKING, PRE- AND POST-COURSE SURVEYS, T- STATISTICS OF DIFFERENCES IN MEANS

CATEGORY OF QUESTION	NUMBER OF QUESTIONS	NUMBER STATISTICALLY SIGNIFICANT
CRITICAL THINKING	11	1
PROBLEM SOLVING	4	1
COMMUNICATION	1	0
TEAMWORK	3	1

Three students in the class were selected to intern at banks for summer 2009; one student interned at a local bank while the other two interned at local branches of super-regionals. Given the economic environment and the state of the financial industry at the time, we were pleased that the students were afforded this opportunity. The students rotated through several of the banking areas including lending, customer service, and financial services. Although the banks exposed the students to multiple banking areas, each institution was given the freedom to place the student in areas that they thought would be most beneficial to the bank and the students. The students and the bank officers were pleased with their progress. Students participating in the internships were subsequently hired by their respective banks. The students agreed that the knowledge and experience gained from the new course and internship better prepared them for careers in banking. The bankers were of the same mind; not only were the students' knowledge of financial services better than their usual applicant, the internship in effect gave the bank the opportunity for a multiple-week interview with concurrent training experience.

CONCLUSION

This paper details the development and institution of a third and fourth commercial banking course for business students at Tennessee Tech University. The idea, the seed of which was planted in a dinner conversation one evening, has not only allowed our students to be better prepared for a career in the banking industry but has also strengthened our relationship with a group of key College stakeholders. In addition, the new courses directly reflect the academic movement toward active learning and provide our constituents the opportunity to be directly involved in curriculum development. Both the students and bankers believed that the new courses better prepared the students for a career in banking and the financial services industry.

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APPENDIX 1

THE ENHANCEMENT OF STUDENT CRITICAL THINKING AND REAL-WORLD PROBLEM SOLVING SKILLS THROUGH NEW BANKING ELECTIVES

Name: Dr. Bob Wood, Dr. Steve Isbell, Dr. Ken Wiant; Unit: College of Business

Goal:
A significant number of graduates of the TTU College of Business begin their employment with a local, regional, or national bank. Financial industry leaders indicate an increasing need for graduates skilled in critical thinking and real-world problem solving. This proposal develops and delivers a three-course sequence that will be specifically designed to give students the opportunity to enhance critical thinking skills that focus on real-world issues in the banking industry. Course requirements will use active learning strategies emphasizing communication and teamwork. The course series will require students to form groups that simulate bank officer and executive teams and make a series of tactical and strategic decisions employing *The Stanford Bank Game* simulation. This simulation is currently used both in the financial services industry and leading academic programs to develop managerial skills necessary for success in the international banking environment. The third course in the sequence is structured as a paid internship that will place students in an Upper Cumberland financial institution. This internship will further develop critical thinking, problem solving, and communication skills in a real-world setting.

Relationship to Potential QEP Focus:
• Improvement of students' critical thinking/real-world problem solving skills using active learning strategies.
• Improvement of students' critical thinking/real-world problem solving skills emphasizing communication and interpersonal skills.
• Improving students' critical thinking/real-world problem solving skills with emphasis on teamwork skills.

Action Plan:
A Banking Advisory Board composed of senior area bankers from local, regional and national financial institutions will be created to discuss, recommend, and develop areas of curricular emphasis and structure, internship development and assessment. The first course in the three-course sequence, Commercial Banking, is currently offered. The Board will review the current topical coverage of the course and recommend necessary changes. The second course, Financial Institution Management, will emphasize the role of critical thinking and real-world problem solving by utilizing the banking simulation to illustrate cause and effect in a realistic bank setting. In addition, the simulation represents a case-based/problem-based active learning environment that requires both teamwork and communication skills. The third course, Banking Internship, is a structured internship with specific objectives and measurable outcomes. The internship will be developed in consultation with the Board, and will provide the student a service-learning opportunity to deal with real-world problem solving and communication skills.

Method of Assessment:
Banking simulation reports and pre- and post-simulation assessment
Internship evaluation by banking institutions
Student papers relating learning experiences in the internship
Biannual Board meetings to access program outcomes and discuss any program augmentation needs
Measurement of the number of program participants employed by banking institutions

Faculty and Student Participants:
Instructional participants include TTU College of Business faculty and area banking industry executives. Internship supervisory and evaluative participants will include TTU College of Business faculty and area banking executives. The course sequence will be open to all majors with an interest in a career in banking.

Project Completion Date: August 2009

Dollar Amount Requested:
The total funding request of $1200 includes:
$900 for the cost of the simulation for 30 students during the first year of implementation
$300 for the cost of acquisition of practitioner-based banking journals by the TTU library

APPENDIX 2

COURSE SYLLABUS: Money and Banking
Prerequisite: Econ 2020

Course Objective: To acquaint the student with the basic elements of banking and monetary theory and how it relates to macroeconomic theory.
Text: http://ttumba.org/Throckmorton/Throckmorton.html. It may be updated..
Course Description: Principles of money, banking, the financial system; the impact of money on economic activity.
Course Content:
Section 1
Introduction
Financial Markets and Institutions
Interest Rates
Section 2
Banking History
Commercial Banking
Legislation and Regulation
Section 3
Deposit Expansion
Federal Reserve System
Monetary Policy Tools
Section 4
Demands for Money and the Quantity Theory
Classical Assumptions and GDP
ISLM Model
International Concepts
Teaching Method: Lecture, discussion, analysis of problems and concepts.
International Business Content: Chapter 13
Ethics Content: Throughout the course
Required Computer Applications: None
Attendance: Required
Evaluation: Four 100 point exams

COURSE SYLLABUS: FIN 4610, Commercial Banking
Prerequisite: ECON 3320
Objective: The objectives of this course are to enhance your understanding of commercial banking including services provided, policies/regulations, organizational structure(s), financial management, and the process of lending money.
Text: *Commercial Banking Management, 6th ed.* by Peter S. Rose
Description: Banking is an essential industry, and, as a result, is highly regulated. At the same time, the definition of banking and banking services is continually changing. A thorough understanding of current and expected operational challenges is requisite for successful management in the highly international marketplace.
Content:
(1) An Introduction to the Business of Banking
(2) Asset and Liability Management
(3) Management of Bank Sources of Funds
(4) Providing Loans to Business and Consumers
(5) Future Growth and Expansion Opportunities
(6) Decisioning Business Loan Request (case work)
Teaching Method: Discussion, problem solving, and group work.
Oral and Written Communication: Class Discussion, cases, and written examinations
Ethics Content: Bank and Banker ethics, multicultural considerations

Required Computer Applications: :Most calculations can be performed on a financial calculator. Students are encouraged to use spreadsheets problem solving and attentive.

Attendance: Attendance is the responsibility of the student. Tardiness is inconsiderate and unprofessional. Please make every attempt to be on time and attentive.

Evaluation:			
	Cases	33%	100 points
	Midterm Exam 1……..	33%	100 points
	Final Exam.……	33%	100 points
			300 points

FIN 4620 COURSE SYLLABUS, Advanced Commercial Banking

Prerequisite: FIN 4610 (Commercial Banking)

Objective: This course focuses on the situations faced by senior commercial banking administrators. The Banrisk Commercial Bank Simulation allows student teams the opportunity to simulate the analysis and decision making process confronted by executive management teams.

Text: *Bank Management and Financial Services, 7th ed.* by Peter Rose and Sylvia Hudgins

Description: Commercial bank profitability; Interest Rate, Credit, Exchange, and Liquidity Risk management; Hedging; Off-Balance-Sheet position management

Content: (1) Bank Profitability
Interest Rate Risk Management
Credit Risk Management
Exchange Rate Risk Management
Liquidity Risk Management
Derivative Hedging Techniques
Off-Balance-Sheet Position Management
Strategic Bank Management

Teaching Method: Lecture, discussion, simulation

Oral/Written Communication: Class discussions, simulation reports, written examination

Ethics Content: Asset/Liability management ethics, multicultural considerations

Required Computer Applications: Banrisk Commercial Bank Simulation.

Attendance: Attendance is the responsibility of the student. Tardiness is inconsiderate and unprofessional.

Evaluation:		
	Banrisk Simulation Reports (12)	300 points
	BanRisk Term Paper	100 points
	Final Exam	100 points
		500 points

SCHEDULE

Session 1 INTRODUCTION
- Long-term Objectives and Strategies
- Financial Performance Evaluation
- Team Assignments and Responsibilities

Session 2 SOURCES AND USES OF FUNDS
- Forecasting Commercial and Consumer Loan Demand
- Forecasting Deposit Flows
- Security Portfolio Design
- ***Team Decision #1***

Session 3 BANK PROFITABILITY: NET INTEREST INCOME
- Income: Securities and Loans
- Expense: Deposits and Purchased Liabilities
- ***Team Decision #2***

Session 4 BANK PROFITABILITY: NON-INTEREST INCOME AND FEES
- Fee Income
- Operating Expenses
- ***Team Decision #3***

Session 5 INTEREST RATE RISK: MEASUREMENT AND MANAGEMENT
Gap Analysis
Forecasting: Yield Curve Analysis
Team Decision #4
Session 6 CREDIT RISK: MEASUREMENT AND MANAGEMENT
Default Risk Exposure Analysis
Credit Scoring Models
Team Decision #5
Session 7 EXCHANGE RATE RISK: MEASUREMENT AND MANAGEMENT
Currency Risk Measurement
Country Risk Exposure
Team Decision #6
Session 8 LIQUIDITY RISK: MEASUREMENT AND MANAGEMENT
Reserve Management
Purchased Liabilities
Team Decision #7
Session 9 CAPITAL STRUCTURE
BIS Capital Regulations
Cost of Capital
Team Decision #8
Session 10 HEDGING: FUTURES AND FORWARDS
Gap Exposure Management
Futures/Forwards Transactions
Team Decision #9
Session 11 HEDGING: OPTIONS
Gap Exposure Management
Options Transactions
Team Decision #10
Session 12 HEDGING: SWAPS
Gap Exposure Management
Swaps Transactions
Team Decision #11
Session 13 OFF-BALANCE-SHEET POSITION MANAGEMENT
Securitization
Loan Sales
Team Decision #12
Session 14 STRATEGIC MANAGEMENT
Marketing and Advertising
Human Resource Management
Simulation Summary
Term Paper Due
Session 15 FINAL EXAM

BANRISK COMMERCIAL BANK SIMULATION

The Banrisk Commercial Bank Simulation realistically simulates the operation of a commercial bank based upon (1) financial decision inputs supplied by teams of student bank managers and (2) a set of economic and competitive conditions reflecting financial characteristics in the economy. The simulation requires teams of students to evaluate the financial position and competitive condition of their simulated bank at the beginning of the contest, and then
Establish financial performance objectives for the bank
Execute operating decisions for the bank that achieve the desired objectives
Evaluate the financial outcome of these operating decisions.

Each simulation team will be comprised of five or six students. The organizational structure and position responsibilities for each group member are outlined below. Decision inputs from each simulation team are due in class on the dates shown in the course syllabus. In order to conduct the simulation effectively, it is imperative that decision input forms be turned in on these dates. LATE INPUT FORMS WILL NOT BE ACCEPTED UNDER ANY CIRCUMSTANCES.

A primary Banrisk project objective is introduction and application of the techniques and methods of financial analysis of banking firms in a realistic setting. In addition, the simulation demonstrates the manner in which individual financial operating decisions within banking firms interact with one another, the effects of the economic environment on overall financial performance, and illustrates how different financial goals may be mutually exclusive. It also provides students with the opportunity to work in collaboration with others to establish financial performance objectives and identify and implement tactics designed to achieve these objectives in a structured environment where individual performance is judged according to the collective financial performance of the group. Finally, Banrisk enhances students' written communications skills by requiring a term paper describing the simulation experience.

Each student will receive two separate grades in connection with Banrisk Project activities. This section summarizes the content of each graded activity and the way in which each activity will be evaluated. The first will a weekly summary report of current position and details of the decision making process in that week's activities. Each of the twelve reports is worth 25 points. Each team will also be required to submit a term paper detailing the goals, operating decisions, and financial performance of their bank at the end of the semester. Authorship of this report represents a group effort, with each respective group member having responsibility for specific sections of the report.

1. Introduction
Analysis of the economic and competitive environment surrounding the bank at the start of the contest, followed by interest rate, inflation rate, and GNP growth rate forecasts for the coming quarter (Economist)
Analysis of the financial condition of the bank at the start of the contest:
Leading Area Report (VP - Lending)
Operations Area Report (VP - Operations)
Controller's Report (Controller)
Statement of the team's business definition, the corporate mission of the bank, and specific group financial goals established at the start of the contest (President)
II. Iteration #1 (4 pages)
2. Iterations
Analysis of the economic and competitive environment surrounding the bank at the start of the quarter; a brief review comparing actual and previously forecast levels of interest rates, inflation, and GNP growth; and a new forecast for interest rates, the inflation rate, and growth in GNP for the coming quarter (Economist)
Analysis of overall financial performance from the preceding quarter; followed by a statement of financial objectives for the coming quarter, the management strategy being used to achieve these objectives, and the expected financial outcome of this strategy. This report should identify and explain any changes in the bank's business definition, corporate mission statement, or goals occurring since the last iteration; and link these changes to the financial objectives and operating tactics planned for the coming quarter (President)
Statement of area Lending tactics implemented this quarter, followed by an evaluation and explanation of the actual financial results that occurred during the quarter (VP - Lending)
Statement of area operating tactics implemented this quarter, followed by an evaluation and explanation of the actual financial results that occurred during the quarter (VP - Operations)
Controller's Report for this quarter, followed by an evaluation and explanation of the actual financial results that occurred during the quarter
3. Conclusions
Summary and analysis of the bank's overall financial performance during the simulation (President)
Description of best management decisions (i.e., those actions which contributed most directly to the attainment of group goals) executed during the simulation
Economic Forecasting and Market Analysis (Economist)
Leading Area Report (VP - Lending)
Operations Area Report (VP - Operations)
Controller's Report (Controller)

Description of worst management decisions (i.e., those actions which contributed most directly to the attainment of group goals) executed during the simulation
Economic Forecasting and Market Analysis (Economist)
Leading Area Report (VP - Lending)
Operations Area Report (VP - Operations)
Controller's Report (Controller)

The team report required from each group represents 20 percent of each group member's final course grade. This report is to be typed, double-spaced, approximately 25 pages in length, and conform to the structural outline provided above. Research reports are due on the date shown in the syllabus. LATE PAPERS WILL NOT BE ACCEPTED. While the Banrisk paper requires a group effort, individual student grades for this project may vary across different members of a given bank team with the quality of each student's contribution to the paper. Each member of the Banrisk team is assigned specific position responsibilities (see the job descriptions shown below) and specific authorship responsibilities (see above). The position responsibility of each student within the group must be disclosed on the title page of the Banrisk report to facilitate the assignment of student project grades.

The financial performance of simulated banks will not affect students' grades for this assignment. Rather, student grades depend upon the quality of the group's written report. Many student teams that do poorly in the contest learn more about bank profitability, capital adequacy, liquidity, etc., than teams exhibiting superior financial performance. Hence, poorly performing teams often receive higher project grades. The quality of the Banrisk written reports will be evaluated according to the students' ability to establish clear, measurable financial objectives and define operating tactics that support these objectives, the students' ability to accurately evaluate the financial position of their simulated banks and the economic environment, and explain why specific simulation outcomes occurred, the students' ability to integrate the different position responsibilities within the project into a coordinated effort to reach collective group objectives, and the students' ability to communicate clearly in a formal, written manner the results of their simulation experience

The Banrisk simulation requires a collaborative effort. Similar to the business world, students must work together to achieve a collective goal, where the performance of the group depends upon the sum total of each individual team member's contribution to the group. Thus, each team member bears a responsibility to the group for the outcome of the project, and a single team member who fails to meet the group's expectations can ruin the performance (and affect the grade) of the entire group. In this circumstance, personnel management becomes a critical component within each Banrisk team. Coordinating the activities of different group members, resolving disputes between various individuals, arranging appropriate times and locations for team meetings, sanctioning group members who do not meet the performance expectations of the group, and rewarding members who surpass group expectations represent some of the activities that each team must manage. These personnel management responsibilities are controlled by student bank teams -- the instructor will not interfere in the organization, structure, and management of the Banrisk teams. As personnel managers, however, you must also have the authority to discipline and/or reward members of your group based on individual performance differences. In order to give you this authority, the contribution of each group member will be evaluated by other members of the group. Instructions will follow.

In order to help students save time and organize their simulated banks in an effective manner, the following listing provides a brief job description for each management position required in the Banrisk project, identifies the financial responsibilities associated with each position, outlines the location of financial data in the Banrisk computer printouts of most interest to each position, and identifies the mini-studies in the Banrisk manual that are most relevant to each position.

PRESIDENT AND CHIEF EXECUTIVE OFFICER (CEO): Determines general bank objectives; develops, integrates, and implements business strategy designed to achieve bank objectives; monitors overall profitability of bank; monitors bank stock price movement; and coordinates and controls all activities of the senior management team.

ECONOMIST: Monitors the financial, competitive, and economic environment surrounding the bank, forecasts financial trends in the banking environment, assesses competitive threats and opportunities within this environment, completes group decision forms on a timely basis, and maintain banks.

VICE PRESIDENT OF LENDING: Manages all aspects of the bank's loan portfolio, including commercial loans, commercial loan commitments, commercial letters of credit, consumer installment loans, credit card receivables, and mortgages.

VICE PRESIDENT OF BANK OPERATIONS: Manages all aspects of the bank's deposit acquisition activity, supervises personnel administration; and controls bank expansion/contraction activity.
CONTROLLER/CHIEF FINANCIAL OFFICER: Manages the bank's investment portfolio, recommends and implements gap management strategy, recommends and implements changes in bank capital structure, supervises trust and accounting activities, and administers corporate banking services (i.e., correspondent banking relationships).

FIN 4630 COURSE SYLLABUS Commercial Banking Internship
Prerequisite: FIN 4620, permission of instructor

Objective: FIN 4630 is designed to provide the student with a practical experience and working knowledge of the commercial banking industry.
Course Content: Internship Procedures:
Internships are arranged via an interview process with the financial institution. Interviews will be coordinated through the Economics, Finance, and Marketing departmental office (JH 216).
An internship application form that includes a summary of the proposed internship should be submitted to the office to obtain prior approval. The internship information form will, among other things, be considered a learning contract among the student, the university, and the employer.
A performance evaluation from the internship employer is required. The performance evaluation may be a standard evaluation form used by the employer or a letter addressed to the faculty member administering the internship. The evaluation should be signed and dated by the person doing the evaluation and should indicate the approximate number of hours worked by the intern. If hours worked are not mentioned in the evaluation, the student must prove hours worked via some other means.
Interns are required to keep a weekly diary of both routine activities and major projects. The diary becomes the basis for the internship paper.
The typical internship paper is 15-20 pages in length. The formal paper should be well organized with major headings and subheadings to distinguish between topics in the paper. Papers are reviewed and suggestions for improvements may be made. Students may be required to revise internship papers and resubmit as needed. Papers submitted with extensive deficiencies are likely to result in the academic grade for the internship being lowered. In short, the paper must be polished and professional. The paper should include a discussion of:

The employer's history, major activities, services, and products.
How the student got the internship.
The activities performed on a day-to-day basis.
All major projects worked on during the internship.
How course work related to and/or helped with assignments.
How the work experience relates to, and or helps in, courses taken since returning to school.

Students may be expected to make an oral presentation concerning the internship experience to classes or student organizations.
The student must submit the internship paper, diary, and employer performance evaluation at least two weeks prior to the last day of the term.

At the conclusion of the internship, the student must complete an internship evaluation form.
At the conclusion of the internship, the faculty may phone the intern employer to discuss performance.

USE OF POWERPOINT SLIDES AND QUIZZES BY ECONOMICS FACULTY

Tammy Parker, University of Louisiana at Monroe
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ABSTRACT

This study examines faculty usage of two types of textbook supplements: PowerPoint slides and quizzes. Results suggest that the majority of faculty made Powerpoint slides available to students; however, there were mixed results regarding faculty perception of the actual importance of the slides. Economics faculty used the slides as a resource for reviewing a chapter or lecture. The use of chapter quizzes is highly mixed, but approximately thirty percent of those that do incorporate chapter quizzes in their courses used the publisher provided test bank.

INTRODUCTION

Major components of instructional supplements of higher education textbooks are PowerPoint slides and a test bank. The purpose of this study is to examine faculty use of these two supplements. Several studies have examined the use of ancillary materials, such as PowerPoint, but few have been in Colleges of Business and even fewer from the perspective of the faculty member (James, Burke and Hutchins 2006; D'Angelo and Wooley 2007; Debevec, Shih, and Kashyap 2006). The use and perceived usefulness of supplements is important in determining their importance in textbook adoption and course design.

Clarke, Flaherty, and Mottner (2001) found PowerPoint lecture outlines to positively influence students' perceived outcomes. Another study examined instructional technologies and found that PowerPoint presentations were significantly related to pedagogical method but not to perceived learning performance or course grade among marketing students (Young, Klemz, and Murphy, 2003).

The evidence of the usefulness of PowerPoint slides is mixed. While some studies have found that it is a positive influence and enhances learning, other studies have found just the opposite (Cyphert 2004; Harris 2004; Jones and Bowen 2004; Wineberg 2005, James, Burke and Hutchins 2006). In terms of student perceptions of PowerPoint, Atkins-Sayre, Hopkins, and Mohundro (1998) found that students believe PPT slides maintain their interest and enhances their understanding and recall of information. In comparing the effectiveness of PowerPoint to plain overheads, a study by Bartsch and Cobern (2003) indicated students perceived they learned more with lectures enhanced by PowerPoint. The same study also found that students scored better on exams with the use of the basic PPT rather than the enhanced version of PPT with additional visual and video materials embedded.

Because of Blackboard, Web CT, Moodle and other Internet-based course management options, many instructors now post their PowerPoint slides online and as a result there has been fear that posting the PPT reduces the need for class attendance. Frey and Birnbaum (2002) found that attendance in classes that posted the PPT slides was down by 15%. Szabo and Hastings (2000), however, found just the opposite.

The study by James, Burke, and Hutchins (2006) was one of the few that examined students within a College of Business. The findings of their research were the following: students have a significantly less favorable perception of the benefit of using PowerPoint slides on cognitive learning than do professors; students believe posting slides on the Internet will decrease class attendance, while professors believe it does not have a negative impact on class attendance; and both students and professors believe PowerPoint slides has a positive impact on taking of notes and studying for exams and quizzes.

Previous research on the use of chapter quizzes found some positive results from quizzes; however, taking chapter quizzes did not improve exam performance (Ryan 2006; Gurung 2003, Brothen and Wambach 2001). In the Gurung (2003) study, students reported practice test questions and online quizzes as most helpful in learning textbook material and in preparing for exams. Empirical examination of the test scores, however, did not find any verification that it increased test performance (Gurung 2003). Brothen and Wambach (2001) found the same. Taking quizzes and looking up quiz answers did not help exam performance. The conclusion of their research was that students were using computerized quizzes to learn the material in lieu of reading and studying the textbook. In Ryan's (2006) study chapter quizzes were given at the beginning of class. The impact was increased attendance and punctuality, but it did not result in better grades on the exams.

Because PowerPoint slides and quizzes are provided by textbook publishers on a routine basis, many professors use them and post them online. While previous studies have examined the impact of these aids in exam performance, this study proposes to examine their usage by economics faculty.

THE STUDY

Data were collected through an e-mail survey process. E-mail addresses were collected from university websites of economics faculty. A total of 3,290 e-mails were sent, 770 were returned for various reasons such as incorrect e-mail address or SPAM filter rejection, resulting in 2,520 delivered e-mails. Usable responses totaled 100 for a response rate of 4.0%. Each respondent was asked to identify one particular class for which they would answer the survey questions. The courses considered for this study were all economics courses.

Table 1 provides a breakdown of the course level. The majority of courses were taught at the sophomore level, 34.0%. At the sophomore level, most universities offer introductory macroeconomics and microeconomics courses that are typically required for all business majors

and are comparatively large courses. Junior level courses accounted for 30.0% of the sample. At the junior level, courses, such as intermediate microeconomics, managerial economics, and money and banking, would be courses required by various business majors beyond just economics majors. Graduate level courses accounted for 14.0% of respondents, senior level accounted for 12%, and freshman level courses only 10.0%.

Table 1

Level	Frequency	Percentage
Freshman	10	10.0%
Sophomore	34	34.0%
Junior	30	30.0%
Senior	12	12.0%
Graduate	14	14.0%

Table 2 provides the demographic profile of the faculty respondents. Males made up 71.4% of the sample. Full professors accounted for 34% of respondents, while other ranks accounted for approximately twenty percent each. Nearly half of respondents have more than twenty years of teaching experience.

Table 2

Demographic Variable	Classification	Percentage
Gender	Female	28.6%
	Male	71.4%
Current Rank	Lecturer or Instructor	20.0%
	Assistant Professor	22.0%
	Associate Professor	24.0%
	Full Professor	34.0%
Years Teaching	5 years or less	16.0%
	6-10 years	18.0%
	11-15 years	10.0%
	16-20 years	8.0%
	More than 20 years	48.0%
Institution Enrollment	Less than 5,000	16.0%
	5,000-9,999	26.0%
	10,000-14,999	16.0%
	15,000-19,999	22.0%
	20,000+	20.0%

The survey consisted of a variety of questions about Powerpoint slides, quizzes and testbanks. The survey asked faculty as to whether they made Powerpoint slides available to students and if so in what manner. Additionally, respondents were asked how much they valued Powerpoint slides, and in what way did they encourage students to use them. Respondents were

asked if they assigned chapter quizzes and if so, how the quizzes were administered and the source of quiz questions.

RESULTS

Faculty were asked if PowerPoint slides are utilized or made available in the course. Approximately 68.1 percent said slides are made available or are used. The next question asked how students accessed to the PowerPoint slides if they were used or made available. Results are shown in Table 3. Note the percentages do not add up to 100% because some instructors make the slides available in more than one way. Not quite half (44.0%) of the professors posted the slides on Blackboard or Web CT. The second most frequent method of access was the use of the PowerPoint slides from the Instructor websites, 18.0%. Only 6% of professors provided handouts of the slides and the same 6% and others provided access to the slides through the publisher's website (8.0%).

Faculty were asked how important the PowerPoint slides were to them. The results are mixed. Approximately thirty-seven percent said it was very important and another 17.6% indicated it was important (See Table 4). However, nearly thirty percent indicated it was not very unimportant and another 6.8% said it was unimportant.

Table 3

Access	Frequency	Percentages
Blackboard/WebCT	44	44.0%
Instructors website	18	18.0%
E-mailed to students	4	4.0%
Class lecture only	6	6.0%
Provided as handouts	6	6.0%
From another student	0	0%
Publisher's website	8	8.0%

Table 4

Level of Importance	Frequency	Percentages
Very unimportant	22	29.7%
Unimportant	5	6.8%
Neutral	7	9.5%
Important	13	17.6%
Very important	27	36.5%

Faculty were asked if they had a choice in how PowerPoint slides were designed, which option they would prefer? Five choices were given and they could select more than one answer. Table 5 shows the results. The vast majority, 49.0%, said they would choose PowerPoint slides that could be modified by the instructor in class. The next highest option, present an outline of

the material from the textbook, was selected by 32.0%. Third choice was slides with material added by the publisher that was not in the textbook, 30.0%. PowerPoint presentations with videos and interviews with professionals were chosen by 20.0%. The least chosen option was slides enhanced with photos, advertisements, and other visuals, 13.0%.

Table 5		
Design	Frequency	Percentages
Modified by instructor to fit material professor presents	49	49.0%
Present an outline of material from textbook	32	32.0%
Photos, advertisements, visuals	13	13.0%
Videos, such as television ads or interviews with professionals	20	20.0%
Material added by publisher not included in textbook	30	30.0%

If slides were available, faculty were asked how they encouraged students to use the slides for studying and reviewing material. Five options were provided and faculty were asked to rate each one on a five-point scale from 'not at all' to 'all of the time." Results are shown in Table 6. The most frequent use was to review chapter material, with a mean of 4.04. The second most frequent use was to review a lecture, with a mean of 3.97. Study for exams had a mean of 3.65, study for quizzes had a mean of 3.48, and prepare for a lecture had a mean of 3.35.

Table 6		
Use	N	Mean
Study for exams	49	3.65
Study for quizzes	48	3.48
Review chapter material	48	4.04
Review a lecture	68	3.97
Prepare for a lecture	49	3.35

The next two questions dealt with chapter quizzes over the textbook material. Faculty was asked approximately how many chapter quizzes they gave. The results are in Table 7. The highest percentage of responses was for no quizzes on textbook material, 27.1%. The second highest was only a few quizzes are given on textbook material, 22.9%. Approximately twenty percent of faculty gave quizzes on most of the chapters and another near twenty percent gave quizzes on all the chapters.

Table 7		
Quizzes	Frequency	Percentages
There are no quizzes on textbook material	26	27.1%
Quizzes are given on all the chapters	18	18.8%
Only a few quizzes are given on textbook material	22	22.9%
Quizzes are given on most of the chapters	20	20.8%
Quizzes are given over about half of the chapters	10	10.4%

Table 8 identifies the sources of the quizzes. The top source was the test bank supplied by publisher with 27.8%. Using materials from the text and from class material and using questions from the textbook and questions created by professor each accounted for twenty-five percent. The fewest responses were for the material not from the textbook but presented in class, with 2.8%, and modifying questions in test bank supplied by publisher with no responses.

Table 8		
Source	Frequency	Percentages
Test bank supplied by publisher	20	27.8%
Textbook material	14	19.4%
Material not in textbook but presented in class	2	2.8%
Material from text and material presented in class	18	25.0%
Modifying questions in test bank supplied by publisher	0	0%
Questions from textbook and ones created by professor	18	25.0%

DISCUSSION

It is clear that most economics faculty (68.1%) utilized or made PowerPoint slides available to students and that the primary method of access is online. However, the perceived importance of Powerpoint slides by economics faculty was found to be mixed. Additionally, faculty perceived reviewing a chapter or lecture as the best function for student use, as opposed to using them to study for a quiz or exam. Faculty did prefer publisher slides that they could edit to best fit their course.

The use of chapter quizzes in economics courses was pretty evenly mixed within the spectrum of no quizzes given to every chapter having an associated quiz. Although, almost thirty percent of the faculty that included quizzes with their course utilized the test bank provided by the publisher.

The questions remain as to what is the optimal amount and type of text supplements as well as optimal course assessment design. However, for economists, this research shows that the majority of faculty make the Powerpoint slides available to students and about a third use the test banks for quizzes.

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THE DEGREE OF CONSENSUS AMONG ECONOMIC EDUCATORS IN A TRANSITION ECONOMY

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ABSTRACT

The question of consensus regarding important economic issues among economists has been studied for over 30 years in many countries with established market economies. The authors investigate the degree of agreement about such issues among economic educators in Belarus by adapting the survey previously used by American and Western European economists. The study specifically analyzes the differences in the views of the former participants of re-training programs vs. non-participants while also comparing them to a survey of U.S. economists. Several statistical measures designed to identify "consensus" are applied to analyze the results. The authors generally find disagreement within the economics profession in Belarus although they conclude that training in market economics principles results in a greater degree of consensus.

KEY WORDS: consensus, economists' views, change of opinions, transition economy.
JEL Code: A11

INTRODUCTION

How much do economists disagree? Various researchers have explored this question over the years (Kearl, Pope, Whiting, & Wimmer, 1979; Frey, Pommerehne, Schneider, & Gilbert, 1984; Block & Walker, 1988; Frey & Eichenberger 1992; Ricketts & Shoesmith, 1992; Alston, Kearl, & Vaughan, 1992; Becker, Walstad, & Watts, 1994; Fuller & Geide-Stevenson, 2003). In a profession with different theoretical and ideological approaches and competing schools of thought some disagreement is inevitable, however, while disagreement among economists is a part of economic tradition, many studies have found that there is more agreement than disagreement among economists in Northern American and Western European countries. This paper adds another dimension to the existing research by examining whether economists from the countries that are in the process of establishing market economies have achieved a similar level of agreement. By replicating the survey of opinions from Alston *et al.* (1992) in Belarus, this paper attempts to answer the following research questions: *What is the degree of consensus on economic issues among Belarusian economic educators? Did retraining programs in market*

economic principles shift these opinions? How do the results of the survey conducted in Belarus differ from the findings of the same survey among American economists?

PREVIOUS RESEARCH ON CONSENSUS AMONG ECONOMISTS

Over the last 30 years a number of studies have examined the areas of agreement and disagreement among economists over time and across countries. The first survey examined economic consensus on 30 propositions. Kearl, Pope, Whiting, and Wimmer (1979) used the criterion of relative entropy. They concluded that there is consensus among economists on most economic issues and found that 211 members of American Economic Association (AEA) tend to agree on "textbook" microeconomic and positively stated issues, but disagree about statements that involve macroeconomic concepts and have value judgments.

Another study (Frey *et al*., 1984) analyzed the results of similar surveys conducted in France, Germany, Austria, and Switzerland and compared the responses to those from the USA. Although the results from each of the four European countries were different, the researchers found the least disagreement among economists regarding issues concerning the effectiveness of the price mechanism and the market system and that American, German, and Swiss economists tended to support typical "textbook" neoclassical propositions, while Austrian and French economists were more inclined to agree with broader government presence in the economy. Frey *et al.* argued that possible causes for this disagreement could be different historical and cultural backgrounds.

Canadian economists Block and Walker (1988) found that Canadian and U.S. economists have similar views on most propositions. In general, Canadian economists also tend to support the idea of effectiveness of the price mechanism in allocation, but they are less supportive of any "interventionist policy" by government than their American colleagues except in areas of government's redistributive role.

Surveys of British economists were published in 1990 and 1992 by M. Ricketts and E. Shoesmith. They found that British economists were more likely to support government intervention into market operations and income distribution.

Another attempt to analyze the degree of consensus was undertaken by Alston, Kearl, and Vaughan (1992). They analyzed the responses of American economists with an updated survey (later referred as AKV-92 survey) in order to look at the shifts in opinions over time. A new "vintage of degree" factor was used and the results showed that it played an important role for 40% of the statements. For example, the respondents who received their degrees in Economics before 1970s showed a greater support for Keynesian propositions and lower support for monetarists' statements.

In 1994 there was a new direction in surveys of the U.S. consensus. After omitting 11 "PhD level" questions from the AKV-92 survey, Becker, Walstad, and Watts (1994) assessed similarity in economic thinking among economists, economic educators, high school social

studies and economics teachers, and journalists. Economists and economic educators showed the highest level of agreement. Among surveyed teachers, the high school economics teachers demonstrated fairly similar views with the economists. The opinions of journalists and secondary social studies teachers deviated from those of economists or economic educators most of all. Among the factors explaining the variation were the differences in completed economics coursework and participation in economics-related professional development programs. Moreover, the authors suggested that the opinions of social studies teachers, who received the least amount of formal training in economics, could be impacted more by the news media rather than by economists.

Fuller and Geide-Stevenson (2003) looked at the dynamics of opinions among the members of AEA since the 1990s. They used 24 questions from the AKV-92 survey and 20 new propositions and applied the consensus index measure. Their findings were grouped by the following areas: international economics, macroeconomics, microeconomics, income distribution, and New Economy issues. The strongest agreement among economists was found in the area of international economics. Interestingly, both strong consensus and no consensus emerged for positive propositions, while economists tended to agree with normative propositions. The tendency that economists are more likely to agree on microeconomic than on macroeconomic propositions has not changed over the years, though the authors suggested that recent empirical studies resulted in a greater disagreement on some "textbook treatments" of allocative efficiency of the competitive price mechanism.

Thus, the literature examining the opinions of economists shows general consensus within the profession in the West. At the same time, economics as a social science reflects the incessant changes that emerge in public policy and public opinions, and these changes in turn influence the degree of agreement among economists and cause economics professors to reconsider the propositions they teach.

TRENDS IN ECONOMIC EDUCATION IN BELARUS DURING TRANSITION

In this paper we examine whether a similar consensus has developed among the economists from the countries that have been moving "from plan to market." Transition periods affect all population groups in one way or another; to some, it is a time of revaluation of values, to others, it is a time of deeper ideological disarray. During the period of ideological and economic confrontation between socialism and capitalism before the 1990s, the choice of adherence to an economic school in the former command economies was often political rather than scientific. Marxian theory was dominant and the only accepted economic theory taught in courses on the *political economy of socialism*. Neoclassical views were presented as criticism of the "vulgar" economic doctrines in courses on the *political economy of capitalism*. Since both subjects were mandatory for obtaining an undergraduate degree and no other views could be openly expressed, the question of consensus among the Marxist economists was not appropriate at that time.

The collapse of the socialist system brought new challenges to academic economists and made them rethink their agenda and core ideas in order to adjust their views and teaching to the new economic and political situation. The fall of the Iron Curtain allowed the inflow of western ideas, textbooks, and training opportunities that made the former "indoctrinated" consensus history. These changes led to a paradigm shift towards a more mainstream view combined with some "heretical" economics.

However, after fifteen years of transition the question of what version of economics to teach at colleges and universities still remains an important issue in these countries. This problem has yet to be resolved because economic educators have had different theoretical backgrounds and re-training opportunities (Kovzik & Watts, 2001). Hence, it seems reasonable to ask whether economic educators themselves believe in the market system and in competitive market forces, and what approach they communicate.

The issue of consensus among economists has long been studied in many countries with established market economies. We extend the previous work done on consensus among economists on theoretical and policy propositions to economic educators in Belarus, a country that has one of the slowest rate of transition to the market economy among the former socialist countries. Given the challenges of transitional period in teaching economics, this study specifically analyzes the differences in the views of Belarusian economic educators who received some training in market economic principles versus those who have not been formally re-trained, while also comparing the results of the Belarusian survey with the original American survey (AKV, 1992).

This research is particularly interesting because the vast majority of economic educators at both the college and high school levels in Belarus are self-educated in mainstream economics, due to limited supply of official retraining programs in this field. During the last fifteen years the gap in the state retraining system has been partially filled by international and nongovernmental initiatives (Kovzik, Kovalenko, Chepikov, & Watts, 2002). One of the most successful opportunities has been offered by the U.S. National Council on Economic Education (NCEE, and as of 2009, Council for Economic Education). NCEE's "Training of Trainers" and "Training of Teachers" programs were conducted in cooperation with the Belarusian Economic Association – an NGO, formed by market oriented economists and businessmen – and have involved about 250 economic educators since 1995. Analysis of the former participants' responses provides an additional opportunity for a comparative analysis of consensus and the impact of international retraining activities.

SAMPLE AND SURVEY

A translated version of the AKV-92 survey consisting of 40 economic propositions, as reported in Alston *et al.* (1992), was administered in Belarus in the spring of 2003. Even though the surveys were conducted with the large time gap, and 1992 results do not reflect the current

opinions among American economists, the AKV-92 survey is still a reasonable point of reference for a country in transition where economic education is in its embryonic stage. Fuller and Geide-Stevenson (2003) provided additional tools for the statistical analysis of the Belarusian data, specifically chi-square test of a uniform distribution and conditional percentage of broad agreement and disagreement on economic propositions, reinforcing the quality of the research results.

Five hundred hard copies of the two-page questionnaire were mailed to economics departments of all major universities, i.e. Belarusian State University, Belarusian State Economic University, Grodno State University, and to high schools that offered economics as a separate subject. The response rate was 40.8 percent.

Most economic educators who participated in the survey had received their formal education before the transition to a market economy; thus, the only difference among the respondents we considered was whether or not they had acquired additional knowledge in the principles of market economy through the system of international workshops and seminars. Of the 204 received surveys, 71 (34.8 %) were filled out by the respondents who had completed NCEE or BEA training programs. For the sake of consistency with the previous U.S. studies, the recipients were asked to express their opinion on suggested economic propositions by choosing either "generally disagree", "agree with provisions", or "generally agree."

MEASURES

Fuller and Geide-Stevenson's (2003) *consensus index* measure was used to measure the degree of consensus among economic educators in Belarus. This index is based on three measures of consensus: relative entropy, a chi-square test of uniform distribution, and the conditional percentage of broad agreement or disagreement on suggested propositions. The first component of the consensus index, relative entropy (ε)[1], varies from 0 meaning perfect consensus to 1 meaning no consensus. With three possible answers (1 - "generally disagree", 2 - "agree with provisions", and 3 - "generally agree"), we interpret a relative entropy index of 0.8 and below to indicate the existence of a consensus, while values higher than 0.8 mean the answers to the economic propositions were relatively equally distributed among the three possible options, implying no consensus.

The second component, the chi-square test was used to test if answers to the economic propositions were uniformly distributed. At a 1% significance level, a chi-square statistics greater than 9.210 will allow us to reject such a hypothesis.[2]

The third component of the consensus index (CI) contrasted conditional percentage of those who disagreed (answer 1) with those who either agreed (answer 3) or agreed with provision (answer 2). If 67 % or more of respondents disagreed or broadly agreed with a proposition, we assumed consensus on this proposition.

Following Fuller and Geide-Stevenson (2003), if all three components indicate consensus, we designated that as strong consensus. If two out of three components indicate

consensus, it was considered as substantial consensus. If only one component out of three indicated consensus, we labeled it as modest consensus. Otherwise, we designated the topic as having no consensus.

DATA ANALYSIS AND DISCUSSION

Table 1 lists the propositions and reports the simple frequency distribution of three possible answer options, the degree of consensus estimated by the relative entropy index, the chi-squared test of a uniform distribution, and the consensus index. The table contains results for the whole sample of Belarusian economic educators (n = 204) and for the sub-sample of economic educators (n = 71) who participated in the NCEE training programs.

Table 1 Propositions, Responses, Entropy, Chi-Squared, Mean Response, and Consensus Index for Belarusian Total Sample and NCEE Trained Sub-Sample

1	2	3	4	5	6	7	8	9	10	11	12
Proposition	R	% total	% NCEE	Mean Total	Mean NCEE	ε Total	ε NCEE	$\chi 2$ Total	$\chi 2$ NCEE	CI Total	CI NCEE
1. Tariffs and import quotas usually reduce the general welfare of society.	1 2 3	13.24 57.35 29.41	2.82 25.35 71.83	2.16	2.69	0.86	0.62	60.97	52.75	SubC	SC
2. Large federal budget deficit has an adverse effect on the economy.	1 2 3	1.96 26.99 71.08	5.63 26.76 67.61	2.69	2.62	0.61	0.71	149.91	42.28	SC	SC
3. The money supply is a more important target than interest rates for monetary policy.	1 2 3	22.06 45.59 32.35	21.13 53.52 25.35	2.10	2.04	0.96	0.92	17.03	13.21	SubC	SubC
4. Cash payments increase the welfare of recipients to a greater degree than do transfers-in-kind of equal cash value.	1 2 3	17.65 41.18 41.18	8.45 50.70 40.85	2.24	2.32	0.94	0.84	22.59	20.81	SubC	SubC
5. Flexible and floating exchange rates offer an effective international monetary arrangement.	1 2 3	16.18 35.29 48.53	16.90 45.07 38.03	2.32	2.21	0.92	0.94	32.38	9.15	SubC	MC
6. As the USSR moves toward a market economy, a rapid and total reform (i.e., "going cold turkey") would result in a better outcome than a slow transition.	1 2 3	39.71 33.82 26.47	14.08 22.54 63.38	1.87	2.49	0.99	0.82	5.38	29.60	N	SubC
7. Minimum wages increase unemployment among young and unskilled workers.	1 2 3	38.24 29.41 32.35	16.90 26.76 56.34	1.94	2.39	0.99	0.89	2.47	17.94	N	SubC
8. An economy in short-run equilibrium at a real GDP below potential GDP has a self-correcting mechanism that will eventually return it to potential real GDP.	1 2 3	23.53 51.47 25.00	16.90 53.52 27.58	2.01	2.13	0.94	0.91	30.26	14.73	SubC	SubC
9. Fiscal policy has a significant stimulative impact on a less than fully employed economy.	1 2 3	17.65 29.41 52.94	8.45 53.52 38.03	2.35	2.30	0.91	0.83	39.53	22.33	SubC	SubC

Table 1 Propositions, Responses, Entropy, Chi-Squared, Mean Response, and Consensus Index for Belarusian Total Sample and NCEE Trained Sub-Sample

1	2	3	4	5	6	7	8	9	10	11	12
Proposition	R	% total	% NCEE	Mean Total	Mean NCEE	ε Total	ε NCEE	$\chi 2$ Total	$\chi 2$ NCEE	CI Total	CI NCEE
10. The distribution of income in the U.S. should be more equal.	1 2 3	35.29 29.41 35.29	67.61 25.35 7.04	2.00	1.39	1.00	0.73	1.41	41.09	N	SubC
11. Wage contracts are the primary factor that prevents the economy from continuously operating at full employment.	1 2 3	27.94 50.00 22.06	22.54 70.42 7.04	1.94	1.85	0.94	0.70	26.56	46.50	SubC	SC
12. Antitrust laws should be enforced vigorously to reduce monopoly power from its current level.	1 2 3	16.18 30.88 52.94	25.35 8.45 66.20	2.37	2.41	0.90	0.76	41.91	37.54	SubC	SC
13. Inflation is primarily a monetary phenomenon.	1 2 3	16.18 33.82 50.00	19.72 38.03 42.25	2.34	2.23	0.92	0.96	35.03	6.11	SubC	MC
14. The government should restructure the welfare system along the lines of "negative income tax".	1 2 3	25.00 39.71 35.29	36.62 33.80 29.58	2.10	1.93	0.98	1.00	6.97	0.54	MC	N
15. Wage-price controls are a useful policy option in the control of inflation.	1 2 3	38.24 34.31 27.45	64.79 25.35 9.86	1.88	1.45	0.99	0.78	3.65	34.16	N	SubC
16. A ceiling on rents reduces the quantity and quality of housing available.	1 2 3	14.71 42.65 42.65	16.90 35.21 47.89	2.28	2.31	0.92	0.93	31.85	10.34	SubC	SubC
17. The Fed should increase the money supply at a fixed rate.	1 2 3	32.35 42.65 25.00	26.76 18.31 54.93	1.93	2.28	0.98	0.90	9.62	15.66	SubC	SubC
18. Effluent taxes or marketable pollution permits represent a better approach to pollution control than imposition of pollution ceilings.	1 2 3	14.71 26.47 58.82	2.82 39.44 57.74	2.44	2.55	0.86	0.71	63.88	33.32	SubC	SC
19. The government should issue an inflation indexed security.	1 2 3	7.35 35.29 57.35	5.64 60.56 33.80	2.50	2.28	0.80	0.76	76.85	32.14	SC	SC
20. The level of government spending relative to GDP should be reduced (disregarding expenditures for stabilization).	1 2 3	22.06 50.00 27.94	18.31 38.03 43.66	2.06	2.25	0.94	0.95	26.56	7.55	SubC	MC
21. The Federal Reserve has the capacity to achieve a constant rate of growth in the money supply if it so desired.	1 2 3	17.65 48.53 33.82	16.90 28.17 54.93	2.16	2.38	0.93	0.90	29.21	16.25	SubC	SubC
22. Economic evidence suggests there are too many resources in American agriculture.	1 2 3	32.35 44.12 23.53	45.07 42.25 12.68	1.91	1.68	0.97	0.90	13.06	13.72	MC	MC
23. Reducing the regulatory power of the Environmental Protection Agency (EPA) would improve the economic efficiency of the U.S. economy.	1 2 3	61.76 30.88 7.35	43.66 46.48 9.86	1.46	1.66	0.78	0.86	91.15	17.69	SubC	MC
24. If the federal budget is to be balanced, it should be done over the course of the business cycle rather than yearly.	1 2 3	22.06 25.00 52.94	8.45 16.90 74.65	2.31	2.66	0.93	0.66	35.56	55.29	SubC	SC

Table 1 Propositions, Responses, Entropy, Chi-Squared, Mean Response, and Consensus Index for Belarusian Total Sample and NCEE Trained Sub-Sample

1	2	3	4	5	6	7	8	9	10	11	12
Proposition	R	% total	% NCEE	Mean Total	Mean NCEE	ε Total	ε NCEE	$\chi 2$ Total	$\chi 2$ NCEE	CI Total	CI NCEE
25. The cause of the rise of the gasoline prices that occurred in the wake of the Iraqi invasion of Kuwait is the monopoly power of the large oil companies.	1 2 3	22.06 41.18 36.76	38.03 18.31 43.66	2.15	2.06	0.97	0.95	12.26	7.55	SubC	N
26. The redistribution of income within the U.S. is a legitimate role for government.	1 2 3	35.29 35.29 29.41	33.80 26.76 39.44	1.94	2.06	1.00	0.99	1.41	1.72	N	N
27. In the short run, a reduction in unemployment causes the rate of inflation to increase.	1 2 3	25.00 42.65 32.35	16.90 40.85 42.25	2.07	2.25	0.98	0.94	9.62	8.65	SubC	MC
28. The major source of macroeconomic disturbances is supply-side shocks.	1 2 3	19.12 58.82 22.06	9.86 64.79 25.35	2.03	2.15	0.88	0.78	59.91	34.16	SubC	SC
29. There is a natural rate of unemployment to which the economy tends in the long run.	1 2 3	7.35 29.41 63.24	16.90 16.90 66.20	2.56	2.49	0.77	0.80	96.97	34.50	SC	SC
30. "Consumer protection" laws generally reduce economic efficiency.	1 2 3	64.71 27.94 7.35	28.17 60.56 11.27	1.43	1.83	0.76	0.83	103.32	26.73	SubC	SubC
31. In the movement from a non-market to a market economy (e.g., Poland) it is important that the ownership of the productive resources be privatized at the onset.	1 2 3	7.35 39.71 52.94	8.45 16.90 74.65	2.46	2.66	0.81	0.66	67.32	55.29	SubC	SC
32. Rational expectations on the part of market participants play an important role in preventing significant swings in real aggregate output.	1 2 3	8.82 51.47 39.71	16.90 35.21 47.89	2.31	2.31	0.84	0.93	59.38	10.34	SubC	SubC
33. Changes in aggregate demand affect real GDP in the short run but not in the long run.	1 2 3	20.59 44.12 35.29	8.45 35.21 57.74	2.15	2.52	0.96	0.81	17.29	25.95	SubC	SubC
34. Large balance of trade deficits have adverse effects on the economy.	1 2 3	5.88 30.88 63.24	15.49 29.58 54.93	2.57	2.39	0.75	0.89	101.21	17.01	SC	SubC
35. Lower marginal income tax rates reduce leisure and increase work effort.	1 2 3	29.41 33.82 36.76	16.90 8.45 74.65	2.07	2.58	1.00	0.66	1.68	55.29	MC	SC
36. Collusive behavior is likely among large firms in the United States.	1 2 3	14.71 23.53 61.76	8.45 47.88 43.66	2.47	2.35	0.84	0.84	76.59	19.97	SubC	SubC
37. The trade deficit is primarily a consequence of the inability of U.S. firms to compete	1 2 3	17.65 48.53 33.82	5.63 54.93 39.44	2.16	2.34	0.93	0.78	29.21	27.07	SubC	SC
38. The competitive model is generally more useful for understanding the U.S. economy than are models of imperfect competition and other game theoretic models.	1 2 3	22.06 50.00 27.94	29.58 38.03 32.39	2.06	2.03	0.94	0.99	26.56	0.79	SubC	MC

Table 1 Propositions, Responses, Entropy, Chi-Squared, Mean Response, and Consensus Index for Belarusian Total Sample and NCEE Trained Sub-Sample

1	2	3	4	5	6	7	8	9	10	11	12
Proposition	R	% total	% NCEE	Mean Total	Mean NCEE	ε Total	ε NCEE	$\chi 2$ Total	$\chi 2$ NCEE	CI Total	CI NCEE
39. Reducing the tax rate on income from capital gains would encourage investment and promote economic growth.	1 2 3	7.35 32.35 60.29	8.45 16.90 74.65	2.53	2.66	0.78	0.66	85.85	55.29	SC	SC
40. The U.S. government should retaliate against dumping and subsidies an international trade.	1 2 3	36.76 44.12 19.12	16.90 36.62 46.48	1.82	2.30	0.95	0.93	20.21	9.66	MC	SubC

Note: $n_{total} = 204$; $n_{NCEE} = 71$.
Column 2 shows possible responses: 1 - Generally Disagree, 2 - Agree with Provisions, 3 - Generally Agree
Columns 3 and 4 report the percentage of responses.
Columns 5 and 6 report Means for Total and NCEE samples
Columns 7 and 8 report relative entropy index, ε;
Columns 9 and 10 report a chi-squared test statistics for goodness-of-fit a uniform distribution of responses test, where $\chi 2 < 9.210$ indicates the null hypothesis that the data fit a uniform distribution cannot be rejected at the significance level $\alpha = 0.01$.
Columns 11 and 12 report the consensus index indicating strong (SC), substantial consensus (SubC), moderate consensus (MC), and no consensus (N).

The measure of relative entropy was the most common and conservative estimate of the degree of consensus in previous studies on consensus. Our results (Column 7, Table 1) show that according to this measure there were 7 out of 40 propositions upon which there was consensus for the whole sample (questions 2, 19, 23, 29, 30, 34 and 39). Propositions 2 (large budget deficit has an adverse effect), 19 (inflation indexed security), 29 (natural rate of unemployment), 34 (adverse effect of large balance of trade deficit), and 39 (reducing tax rate on income from capital gains) prove strong consensus using all measures. The other two propositions, 23 (regulatory power and efficiency) and 30 (consumer protection), fall into the category of "substantial consensus".

The Chi-squared tests showed some degree of consensus on 33 propositions, while the loosest measure of agreement, the conditional broad agreement percentage, yielded consensus on 32 propositions.

As shown in Table 1, for the entire sample of economic educators in Belarus, there are 5 propositions with strong consensus index, 26 propositions with substantial consensus, 4 propositions with modest consensus, and there was no consensus on 5 propositions out of 40. These results are summarized in Column 11.

Most respondents agree that both large budget deficit (proposition 2) and balance of trade deficit (34) have an adverse effect on the economy. On the other hand, they strongly support the idea that the government should provide inflation-indexed security (19). Strong consensus on these issues can possibly be explained by the general negative perception of "deficit" and memories of recent hyperinflation experienced during the Soviet and early transitional periods.

No agreement according to any of the three criteria was demonstrated on propositions 6, 7, 10, 15, and 26. Respondents' opinions varied regarding the most debated issues such as

whether shock therapy is better than slow transition. While some respondents agreed that a minimum wage increase results in higher unemployment among the least skilled workers (7), relying on the "textbook" explanation of the phenomenon, others possibly reflected on a Belarusian reality where direct administrative control overpowers market forces regulating the level of employment. About 60% of respondents broadly agree that wage-price control helps manage inflation (15). It is possible to speculate that they expressed their negative attitude toward inflation without giving consideration to the macroeconomic consequences of applying the above-mentioned instrument. Lack of consensus on income distribution (10) and redistribution of income as a legitimate role of government (26) can be attributed to the complexity of the process of mentality changes during the transition from command to market. In other words, some people were fatigued with the wage-levelling system under socialism while others have nostalgia for the paternalistic role of the government in "good old times". For the same reason, no consensus was found whether "shock therapy" is a better approach to transitional reform (6).

The fact that there are only five propositions with strong consensus and five propositions with no agreement indicates a great deal of disagreement in the whole group of Belarusian economic educators. Dispersion in views might be a result of differences in theoretical background (column 11 of Table 1). The paradigm shift in the economics curriculum did not involve formal re-training among instructors. Thus, it would be interesting to compare the results for the whole Belarusian sample with the opinions of economic educators who have gone through the training in mainstream economics principles.

Out of 204 respondents, 71 marked that they had participated in the "training of trainers" or "training of teachers" programs conducted or supported by the NCEE. To examine the influence of that training on the views of Belarusian economic educators, the same consensus measures were analyzed for this sub-group.

The results are summarized in Table 1, columns 4, 6, 8, 10, and 12. There are 13 propositions for which educators demonstrated strong consensus. The number of propositions with no consensus decreased almost by half (from 5 to 3), as compared to the total sample.

Four propositions with strong consensus were the same in the whole sample and the sub-group. The NCEE-trained educators agreed that a large budget deficit has an adverse effect on the economy (2), the government should "issue an inflation indexed security" (19), that the economy tends to the natural level of unemployment in the long run (29), and lowering the tax rate promotes economic growth (39). The transition from strong to substantial consensus for the sub-group on proposition 34 may indicate that graduates from NCEE programs are aware of the ongoing discussions about the effects of balance of trade deficit on the economy.

For eight propositions the NCEE sub-group expressed strong consensus whereas these propositions were in the category of "substantial consensus" for the total group. These propositions are: 1 (tariffs and quotas), 11 (wage contracts prevent from full employment), 12 (antitrust laws), 18 (effluent taxes and pollution permits are better than pollution standards), 24

(cyclical balancing of the federal budget), 28 (supply shocks cause macroeconomic disturbances), 31(onset privatization of productive resources in transitional economies), 37 (trade deficit due to the inability to compete). Proposition 35 (the effect of marginal income taxes on leisure and work) moved from the "moderate consensus" to "strong consensus" for the sub-group.

Propositions 6, 7, 10, and 15 moved from the "no consensus" to the "substantial consensus" category. These are the propositions about rapid transition, minimum wages that increase unemployment among young people, income distribution inequality, and wage-and-price controls during inflation.

Most of the above mentioned popular "textbook" concepts are commonly covered at the NCEE programs for economic educators and this might have influenced the opinions of this sub-group.

The NCEE-trained sub-group demonstrated no consensus on propositions 14, 25, and 26. There was only one proposition (26) on which results coincide. Regardless of training or background, respondents show diverse opinions on the issue of governmentally directed redistribution of income, which has been one of the most controversial topics in the former socialist economies.

There is a chance that many Belarusian economists are not familiar with the concept of "negative income tax" (14) and it resulted in almost equal distribution of answers among given options. Opinions differed on proposition 25 (monopoly power and increase in gasoline prices after the Iraqi invasion of Kuwait) with 38% who disagree and 62 % who broadly agree (as compared to 78% in the whole group). It demonstrates a better understanding of how markets react to supply shocks.

These findings might suggest that the NCEE training and access to quality instructional materials do serve to shift the thinking of Belarusian economic educators towards the mainstream economics framework that leads to a stronger consensus among them.

The next question of interest would be to look at how far the views of those Belarusian economic educators who received NCEE training in market economic principles deviate from the opinions of economists from a country with developed market economy.

Thus, the next step of the analysis is a cross-country comparison of levels of consensus. For the purpose of international comparison of the survey results, the chi-square, conditional percentage, and consensus indices were calculated for the published AKV (1992) data set. Table 2 reports the statistics of the consensus measures for the Belarusian sub-sample and the American sample.

Table 2 Relative Entropy, Conditional Percentage, Chi-Squared, and Consensus Index for Belarusian NCEE Trained Sub-Sample and AKV-92 Sample

	Belarusian sub-sample					AKV-92 sample				
1	2	3	4	5	6	7	8	9	10	11
	ε	% disagree	% agree & agree with provisions	χ^2	Consensus Index	ε	% disagree	% agree & agree with provisions	χ^2	Consensus Index
1	0.62	2.82	97.18	52.75	SC	0.57	6.5	93.5	321.03	SC
2	0.71	5.63	94.37	42.28	SC	0.79	15.7	84.3	72.05	SC
3	0.92	21.13	78.87	13.21	SubC	0.85	40.1	59.9	23.14	MC
4	0.84	8.45	91.55	20.81	SubC	0.72	15.1	84.9	138.66	SC
5	0.94	16.90	83.10	9.15	MC	0.7	8.4	91.6	158.06	SC
6	0.82	14.08	85.92	29.60	SubC	0.84	40.1	59.9	12.81	MC
7	0.89	16.90	83.10	17.94	SubC	0.74	20.5	79.5	114.27	SC
8	0.91	16.90	83.10	14.73	SubC	0.81	47.6	52.4	50.53	MC
9	0.83	8.45	91.55	22.33	SubC	0.67	9.1	90.9	176.64	SC
10	0.73	67.61	32.39	41.09	SubC	0.85	26.7	73.3	49.25	SubC
11	0.70	22.54	77.46	46.50	SC	0.57	72.4	27.6	344.13	SC
12	0.76	25.35	74.65	37.54	SC	0.92	27.6	72.4	6.69	MC
13	0.96	19.72	80.28	6.11	MC	0.84	28.5	71.5	10.09	SubC
14	1.00	36.62	63.38	0.54	N	0.83	19	81	45.73	SubC
15	0.78	64.79	35.21	34.16	SubC	0.53	73.9	26.1	349.62	SC
16	0.93	16.90	83.10	10.34	SubC	0.52	6.5	93.5	396.18	SC
17	0.90	26.76	73.24	15.66	SubC	0.75	54.1	45.9	116.38	MC
18	0.71	2.82	97.18	33.32	SC	0.74	20.5	79.5	107.98	SC
19	0.76	5.63	94.37	32.14	SC	0.89	36.4	63.6	8.41	N
20	0.95	18.31	81.69	7.55	MC	0.79	44.6	55.4	46.98	SubC
21	0.90	16.90	83.10	16.25	SubC	0.84	36.6	63.4	11.09	MC
22	0.90	45.07	54.93	13.72	MC	0.85	21.3	78.7	65.41	SubC
23	0.86	43.66	56.34	17.69	MC	0.69	62.3	37.7	197.49	SubC
24	0.66	8.45	91.55	55.29	SC	0.72	13.4	86.6	165.17	SC
25	0.95	38.03	61.97	7.55	N	0.63	67.5	32.5	253.10	SC
26	0.99	33.80	66.20	1.72	N	0.73	16.8	83.2	121.52	SC
27	0.94	16.90	83.10	8.65	MC	0.81	39.4	60.6	47.33	MC
28	0.78	9.86	90.14	34.16	SC	0.79	54.7	45.3	129.97	SubC
29	0.80	16.90	83.10	34.50	SC	0.82	30.8	69.2	1.11	MC
30	0.83	28.17	71.83	26.73	SubC	0.76	55.8	44.2	114.11	SubC
31	0.66	8.45	91.55	55.29	SC	0.85	23.7	76.3	16.93	SubC
32	0.93	16.90	83.10	10.34	SubC	0.82	45.9	54.1	61.22	MC
33	0.81	8.45	92.96	25.95	SubC	0.84	43.8	56.2	37.68	SubC
34	0.89	15.49	84.51	17.01	SubC	0.86	33.8	66.2	9.11	N
35	0.66	16.90	83.10	55.29	SC	0.8	43.8	56.2	31.33	MC
36	0.84	8.45	91.55	19.97	SubC	0.82	27.8	72.2	12.71	SubC
37	0.78	5.63	94.37	27.07	SC	0.76	51.5	48.5	80.08	SubC
38	0.99	29.58	70.42	0.79	MC	0.85	39.7	60.3	15.00	MC
39	0.66	8.45	91.55	55.29	SC	0.78	49.8	50.2	62.24	SubC
40	0.93	16.90	83.10	9.66	SubC	0.78	47.6	52.4	75.04	SubC

Possible responses are: 1 - Generally Disagree, 2 - Agree with Provisions, 3 - Generally Agree
Column 1 shows the proposition number Columns 2 and 7 report relative entropy index, ε;
Columns 3 and 4 report the conditional percentage of broad agreement (AG) and disagreement (DG) for NCEE sub-group
Columns 5 and 10 report a chi-squared test statistics for goodness-of-fit a uniform distribution of responses test
Columns 8 and 9 report the conditional percentage of broad agreement (AG) and disagreement (DG) for AKV-92
Columns 6 and 11 report the consensus index indicating strong (SC), substantial consensus (SubC), moderate consensus (Mc), and no consensus (N)

Consensus indices help contrast and compare international opinions. Table 3 provides a summary of propositions distribution by consensus index across the three groups.

Table 3 Distribution of Propositions by Consensus Index across AKV-92, Belarusian Total, and NCEE Trained Groups

	Total	NCEE	AKV-92
Strong Consensus	2, 19, 29, 34, 39	1, 2, 11, 12, 18, 19, 24, 28, 29, 31, 35, 37, 39	1, 2, 4, 5, 7, 9, 11, 15, 16, 18, 24, 25, 26
Substantial Consensus	1, 3, 4, 5, 8, 9, 11, 12, 13, 16, 17,18, 20, 21, 23, 24, 25, 27, 28, 30, 31, 32, 33, 36, 37, 38	3, 4, 6, 7, 8, 9, 10, 15, 16, 17, 21, 30, 32, 33, 34, 36, 40	10, 13, 14, 17, 20, 22, 23, 28, 30, 31, 33, 36, 37, 39, 40
Modest Consensus	14, 22, 35, 40	5, 13, 20, 23, 27, 38	3, 6, 8, 12, 21, 27, 29, 32, 35, 38
No Consensus	6, 7, 10, 15, 26	14, 25, 26	19, 34

Nominally, based on the consensus index, the total Belarusian group demonstrated the least consensus and highest dissension about economic issues. The results of the NCEE trained sub-sample appeared to be closer to the surveyed American economists based on the number of propositions in most CI categories. A similar conclusion can be drawn applying the most conservative consensus measure (ε). The total group has consensus only on 7 propositions, the NCEE trained group agreed on 15, and the American AKV-92 group on 21 (as seen in Tables 1 and 2).

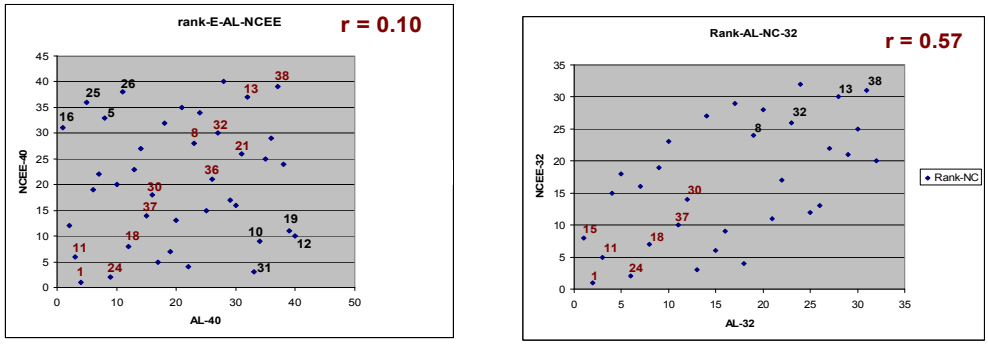
As seen in Table 3, the dispersion of propositions across CI categories is not always similar across the countries and it means that opinions do not coincide and often times are quite opposite. Propositions 19 and 26 are good examples of cross-country opinion dissimilarity.
In order to further examine similarities or differences in opinions across countries, two additional approaches were used: rankings by relative entropy and by weight of opinions (Ricketts & Shoesmith, 1992).

Figure 1(a) presents the correlation of entropy rankings for NCEE trained and American groups for all 40 propositions. The weak correlation ($r = .1$, *p-value = 0.530*) indicates a great difference between the opinions on proposition by proposition comparisons, which is not surprising. Early research studies yielded similar results (Block &Walker, 1988; Frey *et al*., 1992). However, there were 8 outliers indicating contrasting degrees of consensus. There was consensus among American economists, but no consensus among Belarusian on propositions 5, 16, 25, and 26, which are positive statements. On the contrary, there was agreement among Belarusian economic educators, but no agreement among American economists on the following normative propositions: 10, 12, 19, and 31. Unlike the results from previous findings (Kearl *et al*., 1979; Frey *et al*., 1984; Block & Walker, 1988), Belarusians tend to have consensus on normative but dissent on positive "textbook" statements. Closer analysis of the propositions on which the Belarusian consensus contrasted with the American consensus suggests that the questions on which Belarusians disagree are less relevant to the country's reality or economic

history. After removing the propositions with polar consensus results (the outliers), the correlation of relative entropy ranking becomes stronger and statistically significant (*r = .57, p-value = 0.001*).

Figure 1 Correlation of Relative Entropy Rankings AKV-92 and Belarusian NCEE Trained Sub-sample, 40 propositions (a) and 32 propositions (b)

(a) **(b)**

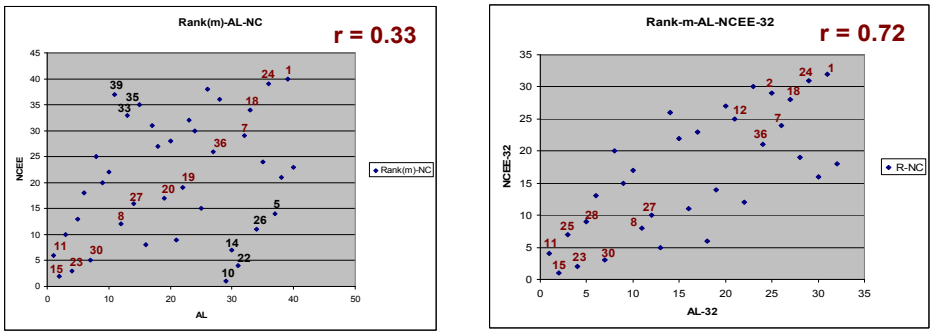


(b)

Figure 2 illustrates the correlation of mean value rankings between the analyzed American and Belarusian groups.

Figure 2 Correlation of Opinion Weight Rankings AKV-92 and Belarusian NCEE Trained Sub-sample, 40 propositions (a) and 32 propositions (b)

(a) **(b)**



For all 40 questions (Figure 2a) the rank correlation coefficient was low but significant (*r = .33, p-value = 0.037*) while again showing opposite opinions on 8 propositions. These results do not support British economists Ricketts and Shoesmith's (1992) claim of an "international consistency" of opinions on economic matters. It is likely the case when an international comparison is drawn on the countries with similar economic systems. American economists mostly disagree with propositions 33, 35, 39, while Belarusian agree. These results are not surprising since the tax burden is very heavy while incomes are low in Belarus and it is likely

that respondents agreed with statements 35 and 39 based on personal experiences rather than supporting a particular school of thought. The picture looks different for propositions 5, 10, 14, 22, and 26 on which Belarusians tend to disagree but Americans agree. One possible explanation for this international discrepancy could be the irrelevancy of these statements to the Belarusian reality. After removing these 8 outliers the correlation of mean value ranking for the remaining 32 propositions increases significantly (r = .72, *p-value < 0.001*). Figure 2b shows that cross-countries opinions are consistent for at least 17 propositions.

Hence, the cross-country comparison showed that the views of Belarusian economic educators who received NCEE training in market economic principles are somewhat similar to the opinions of American economists when the propositions irrelevant to the Belarusian economic actuality are removed.

CONCLUDING REMARKS

The analysis presented in this paper suggests that Belarusian economic educators have mixed opinions on important economic issues since they expressed strong consensus on only five out of forty propositions. Thus, there is much more disagreement within the economic profession in Belarus than in the U.S., where economists demonstrated strong consensus on thirteen propositions (AKV, 1992). Even when there is consensus among Belarusian and American economists on some economic propositions, the views are opposite in many cases. One possible explanation could be the fact that economists from the two countries have different points of reference and therefore their dissimilarity in thinking may be explained by differences in political and economic conditions.

Even though Belarusian economic educators exhibit a wide array of opinions on the market system and market forces, the educators who received NCEE training in market economic principles have shifted their opinions towards the mainstream economics framework and demonstrate a stronger consensus within the group. This partially could be a result of a self-selection bias as those who went through the training could have already had more market oriented views or have been more open to learning about market economies. However, we believe that the comparison with the total sample and the sub-sample still fairly depicts the differences in opinions of the educators from those groups.

We conclude that participation in retraining programs and access to quality instructional materials influence the thinking of economic educators and improve economics teaching in this country in transition.

NOTES

[1] Relative entropy ε is equal to the entropy ($-\Sigma p_i \log_2 p_i$.) divided by the maximum possible entropy, which would reflect a uniform distribution among all the answers.
In our case, $\varepsilon = (p_1 \log p_1 + p_2 \log p_2 + p_3 \log p_3)/\log(1/3)$.

2. $\chi^2 = (O_1 - E_1)^2/E_1 + (O_2 - E_2)^2/E_2 + (O_3 - E_3)^2/E_3$
where O_k ($k = 1, 2, 3$) represent the observed frequencies for three different categories.
E_k ($k = 1, 2, 3$) represent the expected frequencies for each category, i.e. one third the sample size.

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ESTIMATING THE INCREASE IN WAGES FROM MILITARY SERVICE

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ABSTRACT

Using the Current Population Survey data, the return to veterans of the all-volunteer military in the form of higher earnings is estimated using regression analysis. Males with just a high school diploma will earn, on average, about 10% more if they serve in the military. Although there is a positive effect on earnings, the effect is not as large as that attained through additional education.

INTRODUCTION

The benefits of higher education for individuals is well documented in that there is a positive correlation between higher levels of education and higher earnings for all racial/ethical groups and for both men and women (College Board, 2007). Can the same benefits be obtained for military service? That is, does business and industry value an individual's service in the all-volunteer military by awarding an earnings premium for such service—and if so, does the earnings premium exist regardless of race and gender? Can military service be a substitute for higher education? Specifically, can an individual graduating from high school make a choice to enter the military instead of going to college and reap benefits in terms of increased earnings in civilian employment? This study will attempt to ascertain if service in the all-volunteer military can provide a similar advantage in terms of higher earnings that higher education has done over the years.

The value of military service to civilian employment has been studied intensively over the past 50 years. Most early studies of veterans of World War II and Korea found that, over the long run, these veterans had higher earnings than non-veterans (Martindale and Poston, 1979; Little and Fredland, 1979). The earning premium earned by World War II and Korea veterans over non-veterans appeared to exist regardless of veterans' race (Villemez and Kasarda, 1976; Mardindale & Poston, 1979; Little and Fredland, 1979). Studies of Vietnam-era veterans suggested that military service did not have the same consistent income premium impact on civilian earnings that WWII and Korean veterans enjoyed (Schwartz, 1986; Martindale & Poston, 1979; Berger & Hirsch, 1983). Minority group veterans of the Vietnam-era, however, appeared to receive civilian earning benefits, when compared to comparable non-veterans, while many non-minority veterans suffered an income disadvantage (Poston, 1979). Interestingly, some studies found that the Vietnam-era veterans with less education often received a larger

civilian earnings premium than those with more education (Villemez and Kasarda, 1976; Rosen and Taubman, 1982; Berger and Hirsch, 1983).

After the end of the compulsory draft in 1973, researchers began to study the effect that service in the all-volunteer armed forces had on subsequent civilian earnings including protected group veterans, i.e., women and minority group members. A study in 1993 found that the impact of service in the all-volunteer military on subsequent civilian earnings differed with race and education; non-whites and high school dropouts benefited from service in the military while college graduates suffered a large earnings penalty (Bryant, Samaranayake, and Wilhite, 1993). Studies of the earnings premiums of female veterans appear somewhat mixed with one study finding an earnings advantage to female veterans (Mehay and Hirsch, 1996), another finding an earnings advantage to older female veterans and a penalty to younger female veterans (Prokos and Padavic, 2000), and another finding female veterans losing ground relative to their female nonveteran civilian counterparts (Cooney, Segal, Segal, and Falk, 2003).

PURPOSE OF THE STUDY

The purpose of this study is to determine if an earnings premium exists for veterans of the all-volunteer military, and if such exists, to estimate the increase in earnings that results from serving in the all-volunteer military, and to compare that return to the benefit from attaining additional education.

METHODOLOGY

This study employs a variant on the standard human capital wage equation used by most researchers by including a variable to capture the effect on wages from military service. Although most studies typically exclude women from the analysis due to their intermittent labor force participation which renders age an inappropriate measure for experience, we have elected to include females in the first model since they are becoming an increasingly important part of the all-volunteer armed services. Model 2 is the more traditional form which excludes females from the analysis so these results can be compared to the more traditional estimating equation. Model 3 replicates the analysis on just females to compare to the results in Model 2. The regression analysis is also done separately by education groups defined as 1) those with a high school diploma or equivalent, 2) those who had some college education, 3) those who graduated college with a Bachelor's degree, 4) those who attained a Master's degree, and 5) those who attained a Professional or Doctoral level degree. The equations estimated are as follows:

Model 1

$$LogWage = a + b_1\,Age + b_2 Age^2 + b_3 Married + b_4 Black + b_5 Other + b_6 Male + b_7 Military + \epsilon$$

Models 2 and 3

$$LogWage = a + b_1\,Age + b_2 Age^2 + b_3 Married + b_4 Black + b_5 Other + b_6 Military + \epsilon$$

where:

LogWage = natural log of the hourly wage
Age = the age (in years) for the individual and Age^2 is the square of Age
Married = 1 if the individual is married, spouse present
Black = 1 if the individual is only Black
Other = 1 if the individual is neither just Black nor just White
Male = 1 if male
Military = 1 if the individual served in the military

Thus, the base group in Models 1 and 3 consists of single white females who did not serve in the military, while in Model 2 the base group is single white males without military service.

DATA

The source of the data for this study is the 2009 Current Population Survey March Supplement. The CPS is a monthly survey of over 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics and is the official Government statistics on employment and unemployment. The sample is scientifically selected to represent the civilian non-institutional population of the United States. The sample population is located in 792 sample areas comprising 2,007 counties and independent cities with coverage in every State and in the District of Columbia. Currently CPS interviews about 57,000 households monthly. The CPS is the primary source of information on labor force characteristics of the U.S. population and CPS data are used by government policy makers and legislators as important indicators of our nation's economic situation (US Census Bureau, 2009).

Since this study attempts to determine the impact that service in the all-volunteer military has upon civilian pay, the samples we used for analysis were limited by three decision rules. First, only year-round, full-time workers were included in the sample. The U.S. Bureau of Labor Statistics defines year-round workers as being employed for at least 50 weeks a year and full-time workers as working 35 or more hours a week. Second, a minimum age restriction of 25 years was imposed to permit personnel sufficient time to complete their military service and enter the civilian workforce. Third, a maximum age restriction of 53 years was imposed to ensure that only military personnel who volunteered for military service were included in the sample. The military draft was eliminated in 1973, thus any veteran between the ages of 25 and 53 at the time the CPS data was collected would have voluntarily joined the military.

Table 1 presents the sample mean age and percentages for each of the education groups. A few interesting results are readily noticeable. First, the percentage of individuals who are

married increases as education level increases. Second, the percentage Black falls with education level while the percentage Other rises, peaking at the Professional/Doctoral level. Finally, the percent with military service rises to those with some College education but then falls for those with even higher levels of education.

Table 1
Sample Averages

Variable	HS Grad	Some College	College Grad	Masters	Prof/Doctorate
Age	40.2	39.8	39.4	40.3	41.4
Married	63.80%	64.10%	69.10%	73.70%	77.10%
Black	12.30%	12.40%	8.10%	8.90%	5.70%
Other	7.00%	7.90%	10.50%	12.70%	16.10%
Male	60.30%	52.80%	54.80%	52.10%	62.90%
Military	6.70%	8.40%	4.60%	5.00%	3.50%
Num obs	14,317	14,651	12,129	4,480	1,879

RESULTS

Table 2 reports the estimated coefficients from Model 1. The first six rows report the usual regression coefficients from earnings equation estimates. Age and its square term are both significant at greater than the 1% level across all education groups and the signs imply the usual age-earnings profile; the log of wages increases at a decreasing rate. The coefficient estimates on Married are also positive and significant at greater than the 1% level across all education groups. This premium to being married is commonly interpreted to exist because being married serves as a proxy for things such as stability and motivation. It should be noted that the size of the coefficient is somewhat less than commonly reported (see for example, Newman 1988), since those equations are usually estimated with just males. The coefficient estimates in Model 2 indicate a higher premium, similar to other studies.

The race coefficients, Black and Other, are negative across all education groups, but the significance of the coefficients falls from being significant at greater than a 1% level at low education levels to being insignificant (less than 10%) at higher education levels. That would indicate that any bias against minorities tends to diminish as those individuals attain jobs that require higher levels of education.

The coefficients associated with Male are positive across all education levels and indicate a highly significant (greater than 1%) difference in the earnings of males versus females ranging from about 23% to approximately 26%. As mentioned above, including females in these earnings equation estimates is somewhat unusual, but the result that males earn more than females is well known (See, for example, BLS 2009).

Table 2
Regression Coefficient Estimates – Model 1

Variable	HS Grad	Some College	College Grad	Masters	Prof/Doctorate
Intercept	1.5415*	1.5832*	1.1370*	1.5127*	0.59
Age	0.0425*	0.0479*	0.0873*	0.0747*	0.1265*
Age Squared	-0.0005*	-0.0005*	-0.0010*	-0.0008*	-0.0014*
Married	0.0762*	0.0994*	0.1153*	0.1072*	0.1325*
Black	-0.0670*	-0.648*	-0.0904*	-0.0759**	0.0767
Other	-0.0713*	-0.0631*	0.0151	-0.0101	-0.0631
Male	0.2447*	0.2269*	0.2446*	0.2605*	0.2271*
Military	0.1230*	0.0975*	0.016	0.0608	0.0418
F-Statistic	130.60*	151.27*	114.46*	60.04*	16.09*

Note: * = Significant at the .01 level, ** = Significant at the .05 level

The variable Military measures the impact from military service on earnings. The coefficient estimates are positive across all education levels, but only for those with Some College or less are the estimates significant. This indicates that military service has a much greater impact for those who do not pursue higher education. Although military service does have a positive impact on earnings, the effect is clearly greater for those who just graduate from high school or only spend some time in college. There is a 12% premium to those with just a high school degree and a nearly 10% premium if they attend, but never graduate from college. A typical teenager who graduates from high school faces a decision about whether to join the military, go directly to college, or simply enter the workforce. Our results indicate that a white male who is 40 years old, married and only has a high school education will receive, on average, an hourly wage of approximately $15.84. But a married, 40 year old white male with only a high school education who also served in the military can expect an hourly wage of approximately $17.91. However, that increase in wages due to military service pales in comparison to what the same person with a college degree will earn (i.e., $29.63 per hour).

Table 3 reports the regression coefficients for Model 2 which estimates the earnings equation for males alone. Interestingly, the age variables are essentially the same so the argument that these sorts of studies should be done only on males seems questionable. However, our results from Model 3 show that the size of the coefficient estimates for females alone are significantly less than for males. More study would be necessary to further examine these results.

One major difference in the results in Model 2 compared to Model 1 is the impact from being married. The premium for males alone appears to be almost double than what is estimated for all workers.

Table 3 Regression Coefficient Estimates – Model 2					
Variable	HS Grad	Some College	College Grad	Masters	Prof/Doctorate
Intercept	1.5734*	1.6121*	1.1050*	1.6275*	0.8677
Age	0.0519*	0.0568*	0.0967*	0.0771*	0.1204*
Age Squared	-0.0006*	-0.0006*	-0.0011*	-0.0008*	-0.0013
Married	0.1409*	0.1653*	0.2202*	0.1570*	0.2576*
Black	-0.1264*	-0.1229*	-0.2313*	-0.1555*	0.1096
Other	-0.1196*	-0.1058*	0.0318	-0.0206	-0.1546**
Military	0.0934*	0.0790*	0.0055	0.0607	0.0016
F-Statistic	63.81*	71.98*	67.92*	20.22*	8.44*
Note: * = Significant at the .01 level, ** = Significant at the .05 level					

Another interesting difference in the estimates for just males compared to all workers is the size of the negative coefficients on Black. The negative impact from race on just males is nearly twice as large as it is for all workers. Thus, it appears that any discrimination that still exists in terms of earnings is directed mostly at black males.

Finally, comparing the Military variable in the two models we see that the effect from military service disappears at higher education in both. We also see that the estimated increase in wages is lower for males than for everyone. That result becomes clearer when considering the estimates from Model 3.

Table 4 reports the regression coefficients for Model 3 which estimates earnings for females only. Interestingly, although the size of the coefficient estimates for Age and Age Squared are smaller than they are for males alone, they generally still indicate the same earnings profile. The effect of being married is also much lower and in most cases, insignificant. Thus, although being married is seen as a positive influence on earnings for males, it doesn't make any real difference for females. There also appears to be less racial bias for females than males but that result is not uncommon, especially for CPS-type data (Neal, 2004). Most importantly for our purposes here, the coefficients on Military have the same pattern we observed for males, there is a positive and significant impact on earnings for those with Some College or less, but that effect disappears once a college degree has been attained. However, the size of the coefficients are significantly larger, indicating a 16% and 12% wage premium from military service for females with a high school degree or some college respectively. Thus, it appears that female military service is more highly rewarded than military service by males. That could be due to supply effects in the sense that there are many fewer females with military service than males. There is also the "novelty" factor in that female veterans are still a relatively new group.

Table 4 Regression Coefficient Estimates – Model 3					
Variable	HSGrad	Some College	College Grad	Masters	Prof/Doctorate
Intercept	2.09*	1.77*	1.51*	1.50*	0.42
Age	0.01	0.04*	0.07*	0.08*	0.14*
Age Squared	-0.00009	-0.0004*	-0.0009*	-0.0009*	-0.0015*
Married	0.009	0.040*	0.017	0.063**	0.014
Black	-0.029	-0.053*	-0.004	-0.016	0.063
Other	-0.034	-0.041	0.054**	0.004	0.87
Military	0.158**	0.117*	-0.035	0.023	0.098
F-Statistic	13.58*	26.73*	13.54*	9.31*	4.19*
Note: * = Significant at the .01 level, ** = Significant at the .05 level					

CONCLUSIONS

Our results indicate that there is a definite increase in earnings for those who choose to serve in the military and that female veterans are more highly rewarded than male veterans. The increase is strongest among those with lower education attainment and fades as the level of education increases. If an individual is either unable to go to college or chooses not to go, then that individual should certainly consider joining the military as a way to increase lifetime earnings. Although military service is not a substitute for education, we've estimated that it can be somewhat of a complement in that wages will be about 10% higher for males with military service, at least at lower education levels. In addition, the increase in wages from military service at lower education levels is even more pronounced for females (about 12%).

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