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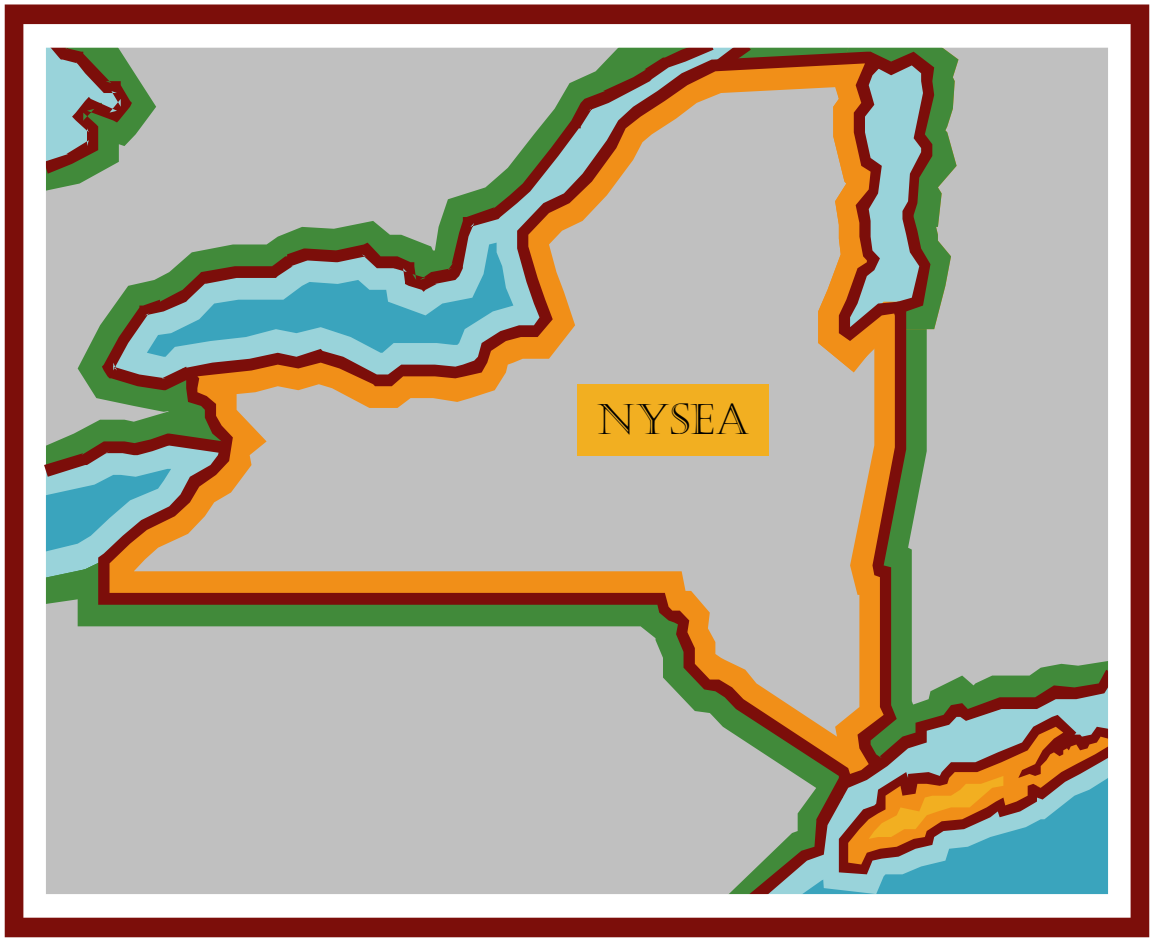

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ARTICLES

EDITORIAL

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

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The Great Recession Effects on Hourly Wages and the Rate of Return to Schooling Between Whites and Blacks in New York

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Kyle Kelly**

ABSTRACT

This paper examines the effects of the Great Recession on the difference in hourly wages and the rate of return to schooling between whites and blacks in New York. Using the American Community Survey 2000-2015, we find that blacks fare relatively worse than whites during the Great Recession and recovery period. Whites earned more than blacks before the recession, and the white-black hourly wage gap increased during and after the recession. The rate of return to schooling was higher for whites than for blacks before the recession, and the white-black gap in the rate of return to schooling was greater during and after the recession, especially for the group under age 40. For people 40 and older, there was no Great Recession effect on the white-black gap in the rate of return to schooling. The change in the wage structure (i.e. the wage change in high educated and low educated whites and blacks) helps us explain the change of the white-black gap in the rate of return between pre- and post-recession periods.

1 INTRODUCTION

The cyclical behavior of labor markets and the impact economic conditions on earnings and the returns to human capital investment have been theoretically analyzed in early studies of Reder (1955) and Oi (1962). Both the studies suggested that unskilled workers should be more subject to cyclical economic conditions than skilled workers. That is, the wage differential between skilled and unskilled workers is expected to be greater during economic expansions and smaller during economic recessions. According to their theories, the returns to human capital investment (i.e. the rate of return to education or post-school training) should be observed to increase in economic expansions and decline in economic recessions.

The 2007-09 economic crisis, known as the Great Recession, was the most severe downturn in the U.S. economy since the 1930s. Figure 1 plots the monthly unemployment rate for the U.S. and New York state. The U.S. unemployment rate was 5.0 percent at the start of the recession in December 2007. Although the National Bureau of Economic Research dates the end of the recession in June 2009, the unemployment rate did not reach its peak of 10.0 percent until October 2009. The overall trend in New York's unemployment rate was similar to the entire economy. Its unemployment stood at 4.9 percent in December 2007 and hit a peak of 8.9 percent at the end of 2009.

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Another prominent feature of the Great Recession and subsequent recovery was the increase in the duration of unemployment. Figure 2 plots the monthly median unemployment duration. In December 2007, the median unemployment duration was 8.4 weeks. This sharply increased over the next two and a half years, reaching a peak of 25.2 weeks in June 2010. The duration remains higher today than its pre-recession levels.

Figure 1. Unemployment Rate in the U.S. and New York

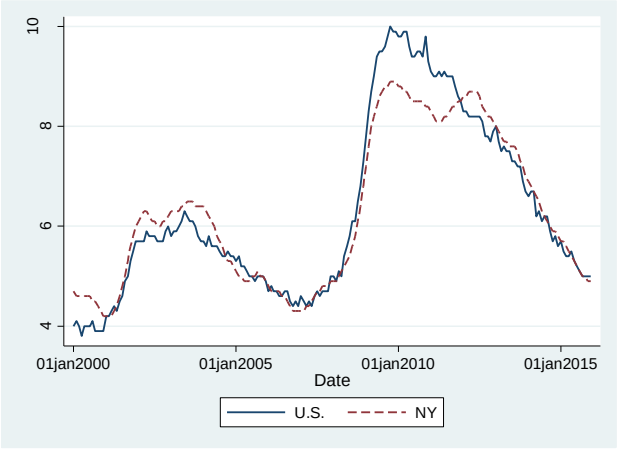
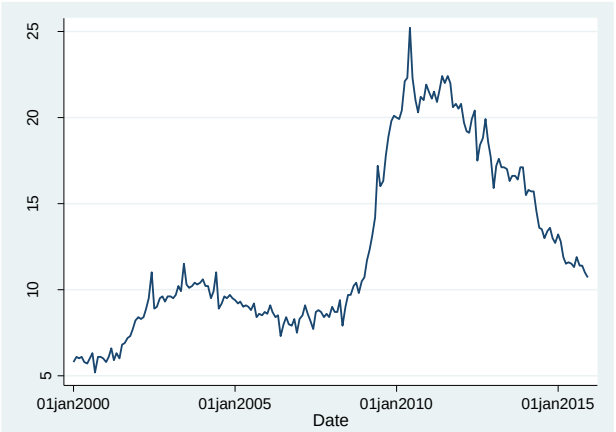


Figure 2. Median Duration of Unemployment Weeks in the U.S.



Date source: U.S. Bureau of Labor Statistics

The question we attempt to explore is the Great Recession's effects on the hourly wage rate gap between whites and blacks. Historically, whites have higher earnings than blacks. The wage gap between whites and blacks may vary depending on cyclical economic conditions. For example, if more cyclical occupations with a higher blacks-whites ratio, such as service workers and laborers, experience greater fluctuations in wages and employment, the wage differential between whites and blacks will be affected during the recession.

We are also interested in the Great Recession's impact on the rate of return to schooling for whites and blacks, and if a difference exists between the two. Traditionally, individuals who invest in additional years of schooling experience higher incomes and lower instances of unemployment. Whether higher-educated individuals fare better during economic downturns depends on the relative shifts in labor demand between skilled and unskilled workers. For example, if an economic downturn sees a disproportionate decline in employment for less-educated individuals, then the rate of return to schooling will increase. However, if a downturn results in a larger decline in demand for higher-educated individuals, then returns to schooling may decline.

This paper investigates the effects of the Great Recession and the current recovery on the hourly wage and the rate of return to schooling for whites and blacks in New York. We are the first to examine the Great Recession effects on the wage differential between whites and blacks, as well as the Great Recession effects on the white-black difference in the rate of return to schooling in New York. Our work contributes to the literature on business cycles and human capital investment.

We explore the white-black difference by estimating a basic Mincer earnings function. Our sample period covers from 2000 to 2015. This allows us to compare the hourly wage and the rate of return to schooling during and after the Great Recession with what existed prior to the recession. We use data from the American Community Survey and find that whites earned more than blacks before the recession, and the white-black hourly wage gap significantly increased during and after the recession. The rate of return to schooling was also higher for whites than for blacks before the recession, and the white-black gap in the rate of return to schooling became larger during and after the recession, especially for individuals under age 40. For those individuals 40 and older, there was no Great Recession effect on the white-black gap in the rate of return to schooling. One possible explanation is that the Great Recession affected whites and blacks differently through their wage structures. For whites, the unchanged rate of return to schooling may be due to the similar decrease in wages at every education level. For blacks, the greater decline in wage for high educated individuals resulted the decrease in their rate of return to schooling.

The remainder of the paper is organized as follows. Section 2 gives a brief literature review. Section 3 presents the data and empirical strategy. Section 4 examines the effects of the Great Recession on the hourly wage and the rate of return to schooling for whites and blacks, as well as the white-black difference in the effects of the Great Recession on the hourly wage and the returns to schooling. We also provide the possible explanation for the white-black difference. We conclude in Section 5 by summarizing the findings from the paper.

2 LITERATURE REVIEW

The rate of return to schooling is a measure of the returns that individuals reap from investing in human capital. In most studies, the rate of return to schooling is estimated as the percentage increase in wage caused by one more year of education based on Mincer's (1974) earnings equation. An individual can determine the efficacy of investing in education by measuring the relationship between the schooling years and the income he/she earns. The rate of return to schooling is also an important indicator of the productivity of education. Research on returns to schooling can also be used by governments as policy guidelines to make decisions about educational programs and educational reforms.

The empirical evidence regarding the wage differential and economic conditions has been found in many studies. Most show the labor market conditions faced by workers are important for understanding contemporaneous wage levels[1]. Some studies have considered the interaction between the education level and labor market conditions. Welch (1979) examines the wage behavior in the job market associated with a rapid increase of the youth labor force caused by the post-world war baby boom. The real wage of college graduates was affected less than others in the 1970-1972 recession. The real income of college graduates, especially those with considerable work experience, rose in 1975 when real income fell sharply for most schooling groups. Oreopoulos et al. (2008) show that the long-term impact of graduating in a recession is larger for lower skill graduates in Canada. Genda et al. (2010) find that there are larger effects of unemployment at the age of graduation for high school workers than for college workers in the US, but the effects for high school workers are less persistent.

Walsh (2010) finds a relatively smaller role for contemporaneous labor market conditions in the evolution of the wage gap than in previous studies. Higher unemployment at the age of high school graduation leads to higher college-high school wage gaps through age 30 in the birth cohort.

The empirical implications regarding the rate of return to schooling in economic conditions have first been explored in Kniesner et al. (1978, 1980). They use cross-sectional data from the National Longitudinal Surveys (NLS) and find that macroeconomic conditions are important determinants of the rate of return to schooling. The relative rate of return to schooling for young whites to young blacks is affected by unemployment. During recessions, blacks fare relatively worse than whites. The findings of King (1980) are consistent with the conclusion of Kniesner et al. (1978, 1980). He uses NLS data 1968 and 1971 and shows that the cross-sectional rate of return is positively related to the unemployment rate. However, the sensitivity of the relationship was not found to be substantially different between the races in his study. Similar results are found in studies of Mexico and Ireland. Psacharopoulos et al. (1996) show the returns to education are positively related to economic conditions in Mexico. The returns are depressed during an economic recession and rise again as economic growth resumes, and remain high even after a significant expansion of the educational system. Heckman et al. (2006) reports a higher rate of return to education for whites than for blacks using 1940–1990 decennial Censuses. However, this finding is not consistent across the literature. For instance, Henderson et al. (2011) use both parametric and nonparametric estimates of the rate of return to schooling between blacks and whites across several decades. Expect for 1940, blacks experienced a higher rate of return to schooling than whites. Ozabaci and Henderson (2015) also find that blacks earn a higher rate of return to schooling than whites and when broken down by various categories (males, females, married, single).

There is also a consistent finding in the literature that whites earn more than blacks, but the wage gap fluctuates over the years. Some studies show that the wage gap between whites and blacks narrowed in the 1960s and 1970s due in part by the equal employment opportunity regulations of 1964, the improvement in school quality, and increased public sector employment[2]. It has also been found that the black-white earnings gap widened between the late 1970s and the 1990s, and narrowed again since late 1990s. For example, Bound and Freeman (1992), using Current Population Survey (CPS) data, show a widening in black-white earnings and employment gaps among young men from the mid-1970s through the 1980s.

3 DATA AND METHODOLOGY

Data

Our sample is drawn from the American Community Survey (ACS) 2000-2015. The ACS data were collected and provided by Integrated Public Use Microdata Series (IPUMS). ACS is an ongoing annual statistical survey which is conducted by the U.S. Census Bureau. It is the largest survey after the decennial census survey, which provides us with enough observations in New York. More importantly, it gathers information on U.S. households and individuals such as demographics, education background, employment status and work history, salary and wage income, occupation, and family interrelationship, which is valuable for this study.

The sample is restricted to whites and blacks between the ages of 18 and 60 who have lived in New York in each survey year since the initial cross-section sample. Furthermore, we drop those individuals who are currently in school, who have no salary and wage income, who have zero work hours, and who reported an unidentified occupation in each survey year. Our restricted sample contains 753,142 observations including 653,585 observations of whites and 99,557 observations of blacks.

The Wage Differential Between Whites and Blacks Before and After Great Recession

The wage variable we use in this study is the hourly wage rates[3]. We calculate this variable by using salary and wage income divided by total annual work hours[4] in each survey year, and adjust it by the CPI[5]. We report the average hourly wage for whites and blacks in New York from 2000 to 2015 in Figure 3. The average hourly wage for whites was about $13.60 in 2000. It slightly increased from 2000 to 2004, and decreased from 2004 to 2008. It increased between 2008 and 2009 and then decreased again between 2009 and 2011. After 2011, it increased until 2015. For blacks, the hourly wage was about $11.10 in 2000, and decreased from 2000 to 2002. There was a relatively high increase between 2002 and 2003, and a decline after 2003 until 2008. The wage increased between 2008 and 2009, and decreased again after 2009.

The difference in the hourly wage between whites and blacks in New York for the years 2000 to 2015 is reported in Figure 4. The white-black difference was about $2.50 in 2000 and it increased to about $3.40 in 2002. The difference declined greatly in 2003, and increased back to $3.40 in 2004. After 2011, it increased again until 2015.

Figure 3 Average Hourly Wage in New York

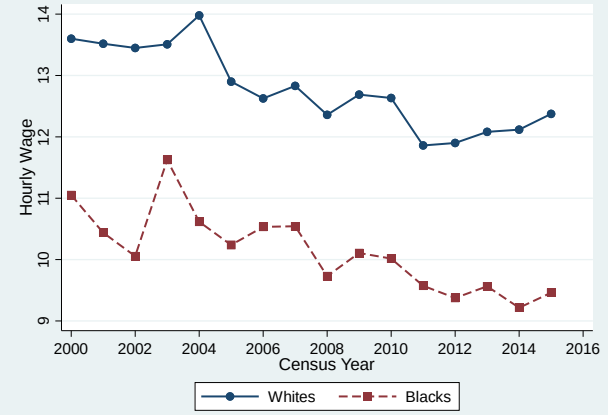
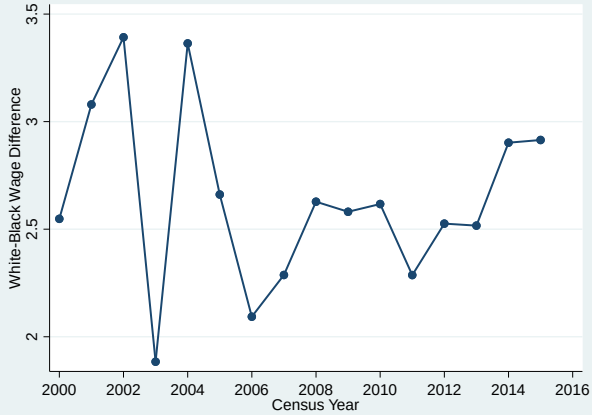


Figure 4 White-black Wage Difference in New York



Date source and notes: American Community Survey 2000-2015.

Primary Estimating Equation

Our primary interests are (1) if the Great Recession affected the rate of return to schooling for whites and blacks, and (2) if there is a difference in the effects of the Great Recession on the rate of return to schooling between whites and blacks.

The economic conditions during a recession, such as local the unemployment, may affect returns to schooling through the wage structure. For example, an increase in the unemployment rate may slow the growth of earnings for the individuals with higher education by a greater percentage than for those with fewer years of schooling. If the unemployment rate increases during the recessions, the rate of return to schooling would fall, ceteris paribus. In addition, if the effects of economic conditions are greater for whites than for blacks, we would observe a significant change in the white-black difference in the rate of return to schooling before and after the Great Recession.

To analyze the problem, we estimate a basic Mincer earnings function that includes a dummy-variable to account for the Great Recession years and the subsequent recovery. The equation takes the form:

$$lnY_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 S_{it} R + \beta_3 R + \gamma X_{it} + \delta D_t + u_{it}. \quad (1)$$

where *i* is the individual index and *t* is the year index. Y is the hourly wage, which is calculated as the CPI-adjusted wage and salary income divided by the annual work hours. lnY is the logarithm of hourly wage. *S* is the schooling variable, defined as the person's total years of education, which is adjusted by the highest degree of the individual. R is the recession dummy variable, taking on the value of 1 for years from 2008 to 2015, and 0 otherwise. $S \cdot R$ is an interaction term of the schooling variable and the recession dummy. X_{it} denotes all the other explanatory variables that may affect the hourly wage in the equation, including potential work experience years (computed as age-S-6), work experience squared, marital status, gender, number of own children in the household, number of own children under age 5 in the household, and occupation. There are a total of 10 categories of occupation based on the ACS 2000-2015[6], including (1) professional and technical; (2) farmers and farm managers; (3) managers, officials and proprietors; (4) clerical and kindred workers; (5) sales workers; (6) craftsmen; (7) operatives; (8) service workers; (9) farm laborers; (10) laborers excluding farm. The definition and the summary statistics of the main explanatory variables are shown in Table 1 below. D_t denotes the year specific variable. u_{it} is the error term with its normal properties.

The rate of return to schooling, $RORS$, which is defined as the percentage increase in hourly wage due to one more year of schooling, is given by the partial derivative of equation (1):

$$\frac{\partial lnY}{\partial S} = RORS = \beta_1 + \beta_2 R. \quad (2)$$

Here, β_1 is a measure of the $RORS$ in the pre-recession years of 2000-2007. The sum of the coefficients, $\beta_1 + \beta_2$, measures the $RORS$ during the Great Recession and current recovery period. β_2 shows whether any difference in the $RORS$ exists between the two periods.

We later modify equation (1) by including a black dummy variable, *Black*, taking on the value of 1 for blacks and 0 for whites.

This allows us to compare any differences in the $RORS$ between whites and blacks. The equation becomes:

$$lnY_{it} = \beta_0 + \beta_1 S_{it} + \beta_2 S_{it} R + \beta_3 R + \alpha_1 Black + \alpha_2 S_{it} \cdot Black + \alpha_3 S_{it} R \cdot Black + \alpha_4 R \cdot Black + \gamma X_{it} + \delta D_t + u_{it}. \quad (3)$$

The $RORS$ is then modified as:

$$\frac{\partial lnY}{\partial S} = RORS = \beta_1 + \beta_2 R + \alpha_2 Black + \alpha_3 R \cdot Black. \quad (4)$$

where the coefficient α_2 shows difference in the $RORS$ between whites and blacks in the pre-recession period, and the sum of the coefficients, α_2 and α_3 represents difference in the $RORS$ between whites and blacks in the post-recession period. The coefficient α_3, gives us the change of the white-black difference in $RORS$ between the pre-recession and post-recession time periods.

The effects of the recession on the wage differential between whites and blacks can be estimated based on equation (1):

$$lnY_{it} = \beta_0 + \beta_3 R + \alpha_1 Black + \alpha_4 R \cdot Black + \gamma X_{it} + \delta D_t + u_{it}, \quad (5)$$

where α_1 represents the wage differential between whites and blacks before the recession. The sum of the coefficients, α_1 and α_4, gives us the wage differential between whites and blacks during and after the recession period. The coefficient α_4, denotes difference in the effects of the recession on the white-black wage differential between the pre-recession and post-recession periods.

Table 1. Definition and Summary Statistics of the Main Explanatory Variables

Variables	Definition	Mean	SD
S	Total years of schooling	14.082	2.817
EXP	Potential years of work experience; =age-S-6	21.933	11.423
MARRIED	=1 if respondent is married or permanently cohabiting; 0 otherwise	0.577	0.494
CHILD	Number of own children in the household	0.918	1.162
CHILD5	Number of own children under age 5 in household	0.169	0.474
FEMALE	=1 if respondent is female; 0 otherwise	0.490	0.500
Occupation Variables			
PROF	=1 if respondent's occupation is professional and technical; 0 otherwise	0.286	0.452
FARM	=1 if respondent's occupation is farmers and farm managers; 0 otherwise	0.001	0.039
MANG	=1 if respondent's occupation is managers, officials and proprietors; 0 otherwise	0.153	0.360
CLER	=1 if respondent's occupation is clerical and kindred; 0 otherwise	0.162	0.368
SALE	=1 if respondent's occupation is sales workers; 0 otherwise	0.062	0.242
CRDF	=1 if respondent's occupation is craftsmen; 0 otherwise	0.082	0.274
OPER	=1 if respondent's occupation is operatives; 0 otherwise	0.071	0.257
SERV	=1 if respondent's occupation is service workers; 0 otherwise	0.146	0.353
FLAB	=1 if respondent's occupation is farm laborers; 0 otherwise	0.003	0.058
LABO	=1 if respondent's occupation is laborers excluding farm; 0 otherwise	0.034	0.181

Date source: American Community Survey 2000-2015.

4 EMPIRICAL RESULTS

We start with estimating equation (5) to obtain the Great Recession effects on the hourly wage between whites and blacks. The results are reported in Table 2 Column 1. The estimated coefficient of *Black*, is -0.028 and it is significant at the one percent level, indicating hourly wage of blacks was lower than that of whites for years 2000 to 2007. The estimated coefficient of $R \cdot Black$ is -0.022 and it is significant at the one percent level. It suggests that the wage differential between whites and blacks was greater for years 2008-2015. The Great Recession significantly increased the white-black wage differential.

We then estimate equation (1) to examine the Great Recession effects on the rate of return to schooling for whites and blacks separately. Column 2 in Table 2 contains the results for the sample of whites. The estimated rate of return to schooling for whites between 2000 and 2007 is 0.096 and the coefficient is significant at the one percent level. It suggests that for whites, each additional year of schooling increased hourly wage by an average of 9.6 percent prior to the Great Recession. After 2007, the estimated rate of return to schooling for whites was the same as that between 2000 and 2007, since the estimated coefficient of the interactive term, *S* and *R*, is insignificant. That is, there is no evidence showing the Great Recession had any effect on returns to education for whites.

The results from the sample for blacks is shown in Column 3 of Table 2. The estimated rate of return to schooling for blacks was 0.080 between 2000 and 2007 and the coefficient is significant at the one percent level, indicating on average, the hourly wage for blacks increases by 8.0 percent by each additional year of schooling before the Great Recession. In contrast to whites, the estimated coefficient of the interactive term for blacks, *S* and *R*, is -0.005 and it is significant at the one percent level. It suggests that compared to the pre-recession period, the rate of return to schooling for blacks declined by 0.5 percentage point during the Great Recession and recovery period. The Great Recession significantly decreased returns to education for blacks.

To check to see if the Great Recession had a different effect on the rate of return to schooling between blacks and whites, we estimate equation (3) and report the results in Table 2 Column 4. Before the Great Recession, the rate of return to schooling for blacks was 1.6 percentage points lower than for whites. This is given by the estimated coefficient of *S*· *Black*, which is -0.016 and significant at the one percent level. This finding (i.e. the rate of return to schooling is higher for whites than for blacks) is consistent with most of the previous studies. The estimated coefficient of the interaction term, *S*· *R*· *Black*, is -0.005 and is significant at the one percent level, suggesting the black-white difference in the rate of return to schooling declined by 0.5 percentage points for the years after 2007. That is, the Great Recession significantly reduced the difference in the returns to schooling between blacks and whites. During the Great Recession and recovery period, blacks fared relatively worse than whites. The rate of return to schooling for blacks was even lower in the post-recession period.

Table 2. Estimation Results

	Total (1)	Whites (2)	Blacks (3)	Total (4)
S		0.096***	0.080***	0.097***
		(0.001)	(0.001)	(0.001)
S· R		0.001	-0.005***	0.001
		(0.001)	(0.002)	(0.001)
S· R· Black		-	-	-0.005***
				(0.002)
S· Black		-	-	-0.016***
				(0.001)
R· Black	-0.022***	-	-	0.053**
	(0.005)			(0.023)
Black	-0.028***	-	-	0.222***
	(0.004)			(0.019)
R	-0.066***	-0.088***	-0.054**	-0.092***
	(0.006)	(0.012)	(0.030)	(0.011)
Other Control Variables	Yes	Yes	Yes	Yes
Occupation Effect	Yes	Yes	Yes	Yes
Year Effect	Yes	Yes	Yes	Yes
Constant	1.323***	0.178***	0.421***	0.176***
	(0.007)	(0.011)	(0.029)	(0.011)
Observations	869,965	750,831	119,134	869,965
R-squared	0.254	0.326	0.246	0.318

Date source and notes: American Community Survey 2000-2015.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results for People Under Age 40

In addition to schooling, the time spent on work (i.e. work experience) is another important determinate of labor earnings. Older people with more work experience may have a lower probability of being unemployed or out of the labor force during a recession, while the wage and employment of young cohorts with less work experience are more sensitive to economic conditions. Thus, it is possible that economic downturns may generate a greater change in the rate of return to schooling for older people than for younger ones. To test this hypothesis, we divide our sample into two subgroups by age: whites and blacks who are below age 40, and those who are 40 and older. Age 40 is chosen due to the concave shape of age-earnings profile (Mincer, 1974). Based on our results from Table 1, we calculate the peak point of the age-earning profile and it is around age 40. We then apply the regression procedure we used for the whole sample to each subgroup.

The estimation results from the group under age 40 are reported in Table 3 below. Column 1 gives us the Great Recession effects on the white-black wage differential. For years 2000-2007, the hourly wage for blacks was lower than for whites, since the estimated coefficient *Black* is negative and significant. For years 2008-2015, the hourly wage for blacks compared to whites is even lower, given by the negative and significant coefficient of the interactive term, *R* and *Black*. The Great Recession made the white-black wage differential greater for those under 40.

As shown in Column 2, the estimated rate of return to schooling for whites under age 40 between 2000 and 2007 is 0.115, indicating every additional year of schooling increased the hourly wage of whites under age 40 by 11.5 percent before the Great Recession. The Great recession, however, has no effect on their returns to schooling, given by the insignificance of the estimated coefficient of the interactive term, *S· R*. For blacks under age 40, the estimated rate of return to schooling between 2000 and 2007 was 0.100 as shown in Column 3, implying their hourly wage will increase an average of 10.0 percent for each additional year of schooling. The Great Recession significantly reduced their rate of return to schooling by 0.5 percentage points, since the estimated coefficient of *S· R* is -0.005 and significant at the five percent level. The difference in the effects of the Great Recession on the rate of return to schooling between whites and blacks are shown in Column 4 of Table 3. The estimated coefficient of *S· Black* is -0.012 and significant at the one percent level. It means on average, the rate of return to schooling for blacks between 2000 and 2007 was 1.2 percentage points lower than that of whites. The Great Recession significantly decreased the difference in the rate of return to schooling between white and blacks under 40 by 0.5 percentage points. The coefficient of the interactive term, *S· R· Black*, is -0.005 and is significant at the five percent level.

Table 3. Estimation Results (Age<40)

	Total (1)	Whites (2)	Blacks (3)	Total (4)
S		0.115***	0.100***	0.115***
		(0.001)	(0.002)	(0.001)
S· R		-0.000	-0.005**	0.000
		(0.001)	(0.002)	(0.001)
S· R· Black		-	-	-0.005**
				(0.003)
S· Black		-	-	-0.012***
				(0.002)
R· Black	-0.023***	-	-	0.050
	(0.007)			(0.035)
Black	-0.044***	-	-	0.157***
	(0.005)			(0.029)
R	-0.101***	-0.096***	-0.068**	-0.100***
	(0.008)	(0.017)	(0.044)	(0.017)
Other Control Variables		Yes	Yes	Yes
Occupation Effect		Yes	Yes	Yes
Year Effect		Yes	Yes	Yes
Constant	1.239***	-0.149***	0.115***	-0.142***
	(0.012)	(0.016)	(0.043)	(0.016)
Observations	401,274	342,478	58,796	401,274
R-squared	0.258	0.349	0.233	0.334

Date source and notes: American Community Survey 2000-2015.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Results for People Ages 40 and Older

Table 4 below shows the estimated regression results for whites and blacks ages 40 and above. Before the Great Recession, blacks had, on average, a lower hourly wage than whites, given by the negative and significant coefficient of the dummy variable *Black*.

During the Great Recession and recovery period, the wage difference between whites and blacks significantly increased, since the coefficient of *R· Black* is negative and significant. Blacks fare relatively worse than whites in hourly wage.

For whites, as indicated in Column 2, the estimated rate of return to schooling between 2000 and 2007 is 0.085 and it is significant at the one percent level, meaning every additional year of schooling increased the hourly wage of whites ages 40-60 by 8.5 percent before the Great Recession. The Great Recession increased their returns to schooling by 0.2 percentage points, since the estimated the coefficient of *S· R* is 0.002 and significant at the one percent level. For blacks, as shown in Colum 3, the estimated rate of return to schooling between 2000 and 2007 is 0.069 and it is significant at the one percent level, suggesting every additional year of schooling increased the hourly wage of blacks ages 40-60 by 6.9 percent before the Great Recession. Their returns to schooling did not change during the Great Recession and the recovery period, given the insignificance of the coefficient of *S· R*. Column 4 provides the results of the difference in the returns to schooling between whites and blacks ages 40 and above before and after the Great Recession. Before the Great recession, there was a significant difference of 0.015 in the rate of return to schooling between whites and blacks. The estimated coefficient of *S· Black* is -0.015 and is significant at the one percent level. It suggests every additional year of schooling increased the hourly wage by 1.5 percentage points more for whites than for blacks between 2000 and 2007. The estimated coefficient of *S· R· Black*, however, is insignificant. That is, the Great Recession had no effect on the difference in the rate of return to schooling between whites and blacks ages 40 and older.

Table 4. Estimation Results (Age≥40)

	Total (1)	Whites (2)	Blacks (3)	Total (4)
S		0.085***	0.069***	0.085***
		(0.001)	(0.002)	(0.001)
S· R		0.002***	-0.002	0.002***
		(0.001)	(0.002)	(0.001)
S· R· Black		-	-	-0.003
				(0.002)
S· Black		-	-	-0.015***
				(0.002)
R· Black	-0.020***	-	-	0.017
	(0.006)			(0.030)
Black	-0.020***	-	-	0.226***
	(0.005)			(0.025)
R	-0.035***	-0.089***	-0.078*	-0.091***
	(0.008)	(0.016)	(0.040)	(0.016)
Other Control Variables		Yes	Yes	Yes
Occupation Effect		Yes	Yes	Yes
Year Effect		Yes	Yes	Yes
Constant	2.400***	1.242***	1.445***	1.243***
	(0.022)	(0.025)	(0.062)	(0.023)
Observations	468,691	412,586	60,338	468,691
R-squared	0.181	0.239	0.184	0.236

Date source and notes: American Community Survey 2000-2015.
Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

An Explanation on the White-black Difference in Great Recession Effects

Our results show that the Great Recession affected the rate of return to schooling differently between whites and blacks. Compared to the pre-recession period, returns to schooling for whites did not change during the Great Recession and recovery period, while returns to schooling for blacks were significantly lower in the post-recession period. One possible explanation is that the recession may affect whites and blacks differently through the wage structure. That is, the wages of more highly educated and less educated people may change during and after the recession by different magnitudes, which may lead to a bigger/smaller wage differential between highly educated and less educated people, and then result in an increase/decrease in the rate of return to schooling. If the recession decreases whites' wages for those with less education and those with more education by a similar magnitude, the rate of return to schooling for whites will remain the same during and after the recession. In contrast, if the wage change of blacks is higher for those with more education than those with less education, the returns to schooling for blacks will decrease in the post-recession period.

To test our hypothesis, we divide the sample into five subgroups by education level: below high school (schooling years less than 12), high school (12 years of schooling), some college (schooling years more than 12 but less than 16), college (16 years of schooling), and beyond college (schooling years more than 16). To observe the wage change for each educational group, we plot the average hourly wage for each education group for years 2000-2015 for whites and blacks in Figure 5 and Figure 6, respectively. Overall, the hourly wage of whites for all education groups slightly declined between 2000 and 2015. The results are similar for blacks. The hourly wage of blacks for all education groups slightly declined between 2000 and 2015, except an increase for beyond college in year 2003, an increase for college in 2007, and an increase for below high school in 2006.

Figure 5. Average Hourly Wage of Whites by Education Level

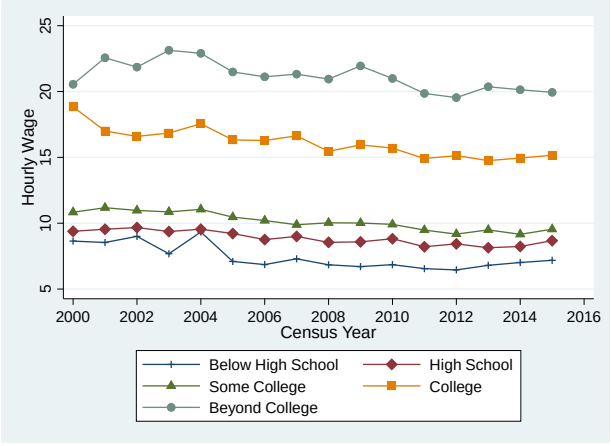
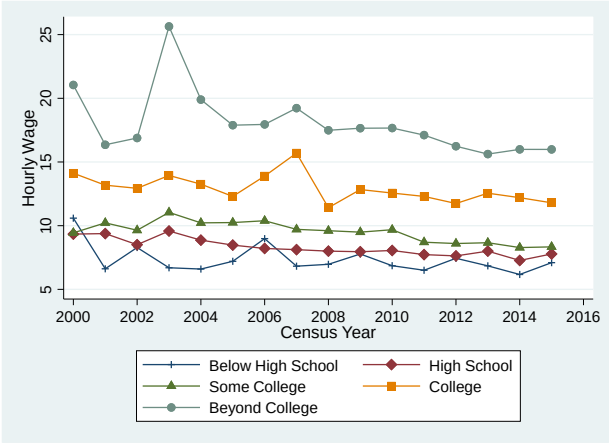


Figure 6. Average Hourly Wage of Blacks by Education Level



Date source and notes: American Community Survey 2000-2015

We then calculate the average hourly wage as well as the change in hourly wage between the pre-recession period and post-recession period for whites and blacks at each education level, and report the results in Table 5 and Table 6, respectively. For whites, as shown in Table 5, there was a $0.83 wage decrease for those with education below high school, and a $1.24 wage decrease for those with education beyond college. The difference in the wage change was slightly bigger for those with more education than those with less education, which may lead to a slightly higher rate of return to schooling for whites during and after the Great Recession. However, the increase in the rate of return to schooling was positive, but not significant from our results (Table 2, Column 2). For blacks, as shown in Table 6, the wage decreased by $0.61 for those with schooling below high school, and it declined by $2.22 for those with education beyond college. The greater difference in wage changes will generate a smaller wage gap between low and high educated blacks in the post-recession period. The rate of return to schooling for blacks, thus decreased during the Great Recession and recovery period.

Table 5. The Average Wage and the Percent Change in Average Wage for Whites

	Wage		Change in Wage
	2000-2007	2008-2015	
Below High School	7.623	6.792	-0.831
High School	9.167	8.458	-0.709
Some College	10.457	9.606	-0.851
College	16.670	15.250	-1.420
Beyond College	21.705	20.469	-1.235

Date source and notes: American Community Survey 2000-2015.
Change in wage = this period's wage-last period's wage

Table 6. The Average Wage and the Percent Change in Average Wage for Blacks

	Wage		Change in Wage
	2000-2007	2008-2015	
Below High School	7.575	6.965	-0.609
High School	8.544	7.796	-0.748
Some College	10.139	8.902	-1.237
College	13.819	12.169	-1.651
Beyond College	18.880	16.662	-2.219

Date source and notes: American Community Survey 2000-2015.
Change in wage = this period's wage-last period's wage

To find out why the rate of return to schooling did not change for whites under 40, but decreased for blacks under 40, as well as why the rate of return to schooling increased for whites 40 and above, but remained the same for blacks 40 and above, we compute the change in the wages for whites and blacks at each education level for those two age groups. Table 7 shows the results for the group under 40. The hourly wage decreased by $0.65 for those with education below high school and $2.24 for those with education beyond college. The rate of return to schooling for whites should decrease due to a decrease in the wage differential between high and low education groups. We did find a significant decrease in returns to schooling (Table 3, Column 2).

For blacks, the wage for those with education below high school decreased by $0.68, and the wage for those with education beyond college decreased by $1.23. The grater wage gap between more and less educated groups explains the decreased returns to blacks under 40 (Table 3, Column 3).

Table 8 provides the results for the group ages 40 and above. For whites, there was a $1.18 decrease in the wage for those with education below high school, and only a $0.26 decrease in the wage for those with education beyond college. Therefore, we expect to observe a higher rate of return for whites 40 and older during and after the Great Recession, due to the increased wage gap between high and low education groups. For blacks, the wage decreased by $0.54 and $2.74 for those with education below high school and beyond college, respectively. The wage gap between high and low education groups will be smaller due to these changes. Although the estimated change in the rate of return to schooling for blacks 40 and older between pre- and post-recession periods was negative, it is insignificant (Table 4, Column 3). In both age groups, the wage change among less-educated blacks was relatively small. A larger proportion of blacks working at the minimum wage may explain the smaller decline in wages for blacks during the recession.

Table 7. The Average Wage and the Percent Change in Average Wage for Whites and Blacks (Age<40)

	Whites			Blacks		
	Wage		Change in Wage	Wage		Change in Wage
	2000-2007	2008-2015		2000-2007	2008-2015	
Below High School	6.286	5.634	-0.653	6.903	6.226	-0.677
High School	7.519	6.548	-0.971	7.325	6.495	-0.831
Some College	8.397	7.219	-1.178	8.557	7.319	-1.238
College	14.121	12.285	-1.836	11.962	10.429	-1.532
Beyond College	18.226	15.989	-2.237	15.216	13.986	-1.229

Date source and notes: American Community Survey 2000-2015.
Change in wage = this period's wage-last period's wage

Table 8. The Average Wage and the Percent Change in Average Wage for Whites and Blacks (Age≥40)

	Whites			Blacks		
	Wage		Change in Wage	Wage		Change in Wage
	2000-2007	2008-2015		2000-2007	2008-2015	
Below High School	9.084	7.905	-1.179	8.158	7.614	-0.543
High School	10.376	9.811	-0.565	9.697	8.991	-0.706
Some College	12.420	11.922	-0.498	11.889	10.828	-1.060
College	19.264	18.351	-0.913	15.793	13.986	-1.807
Beyond College	23.780	23.521	-0.259	21.057	18.313	-2.744

Date source and notes: American Community Survey 2000-2015.
Change in wage = this period's wage-last period's wage

5 CONCLUSION

According to most studies, the wage differential between skilled and unskilled workers is expected to be greater during economic expansions and smaller during economic recessions, and thus returns to education should be observed to increase in economic expansions and decline in economic recessions. The Great Recession was the most severe downturn in the U.S. economy since the 1930s. The purpose of this paper is to examine the effects of the Great Recession on the hourly wage and the rate of return to schooling for whites and blacks in New York.

Using the data from ACS 2000-2015, our findings are as follows. First, the hourly wage of whites was higher than blacks before the recession. The Great Recession significantly increased the wage gap between whites and blacks. Second, the rate of return to schooling was higher for whites than for blacks before the Great Recession. Third, the rate of return to schooling for whites did not change during the Great Recession and recovery period compared to the pre-recession period, while the rate of return to schooling for blacks showed a significant decline of 0.5 percentage points. Further, there was a significant difference in the impact of the Great Recession on the rate of return to schooling for whites and blacks. The Great Recession decreased the black-white gap in the rate of return to schooling by 0.5 percentage points. During the Great Recession and recovery period, blacks fared relatively worse than whites in New York.

We then extend our regressions to whites and blacks in two age groups: under 40, and 40 and above. For both the groups, we find whites earned more than blacks before the recession, and the wage differential between whites and blacks was bigger in the post-recession period. Among those under 40, the Great Recession had no effect on the rate of return for whites, but decreased the rate of return by 0.5 percentage points for blacks. During the recession and recovery period, the black-white difference in the rate of return declined by 0.5 percentage points. Again, for those under 40, blacks fared relatively worse than whites in New York in the post-recession period. The findings are different for the group ages 40 and above. There was a 0.2 percentage point increase in the rate of return to schooling for whites, but no change for blacks between pre- and post-recession periods. Also, there is no difference in the rate of return to schooling gap between whites and blacks during and after the Great Recession compared to that before the recession.

We investigate the difference in the effects of the Great Recession on the rate of return to schooling between whites and blacks by examining the change in their wage structures. For whites, although the wage decreased more for the highly educated group than the less-educated group, the difference in the magnitude of the changes was not very large. Therefore, the increase of the rate of return to schooling for whites after the recession was insignificant. For blacks, more highly educated groups (beyond college) experienced a much bigger decline in their wage rates than those with less education. Thus, the wage gap between high and low education groups was bigger for blacks after recession, which can explain the decrease in rate of return to schooling for blacks over the Great Recession.

We also find the changes in wage structure are different for the two age groups. For the age group under 40, the decline in wages for whites was bigger for the highly educated group than the less educated group.

For blacks, the wage decline for those with high education was much bigger than those with low education. The wage differential between high and low educated people, should have decreased in the post-recession and lowered the rate of return to schooling for blacks under 40. For the age group 40 and above, the wage decrease was greater for whites with low education than those with high education, which resulted in an increase in their returns to schooling during and after the recession. For blacks, however, even though there was a bigger wage decrease for high education people than the low education ones, the change in the wage gap between high and low education groups was not great enough to lead to a decrease in the rate of return.

A natural extension is comparing the effects of the Great Recession on the rate of return to schooling between men and women. Evidence shows that in general, women earn a higher rate of return to schooling than men (Dougherty 2003; Polachek 2008). This finding has been consistent both in the U.S. and other nations. (Trostel et al. 2002, Psacharopoulos and Patrinos 2004). This difference in returns to schooling may vary over the business cycle.

Another possibility is to compare the rate of return to schooling for New York residents by region. Industry mixes differ between urban and rural areas and the effects of the Great Recession was not the same across industries. We would not expect the rate of return to schooling to be the same across regions of the state.

Finally, one could look more in-depth at the business cycle effects on the rate of return to schooling by separating the data into recession years and recovery years. These could be compared across historical recessions. For instance, how did the returns to education compare during the 2008-10 recession with the 1980-1981 downturn? The economy recovered more quickly from the 1980-81 recession than it did during the Great Recession. How did the rate of return to schooling compare across these two different recovery periods? We leave these possibilities to for further research.

ENDNOTES

1. See Beaudry and DiNardo (1991); Katz and Autor (1999); Oyer (2006, 2008); McGuinness, McGinnity and O'Connell (2009); Kahn (2010); Schmieder and von Wachter (2010).
2. See Card and Krueger (1992), Charles (1984), Hout (1984), and Welch (1973).
3. Different studies define earnings in different ways. Some early papers use earnings in levels. For example, Mincer (1974), and Rumberger and Daymont (1987) use annual earnings in their studies. Most recent papers use hourly wage rates. For example, Trostel, Walker and Woolley (2002), Dougherty (2005), and Hanson and Wahlberg (2005) use log hourly wage as the dependent variable in their studies.
4. The annual work hours is computed as weeks worked last year multiplied by usual hours worked per week for year 2001-2007. For years 2008-2015 the variable weeks worked last year is categorical. We use the median value of each category as the value for this variable. This calculation may lead to some outliers with very high hourly wage rates. Therefore, we drop the observation with annual work hours less than 20 or the hourly wage higher than $10,000.

5. For urban consumers, base year 1982-1984. The data is from Bureau of Labor Statistics.
6. The categories are based on 1950 occupation code.

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Demand for HIV Testing and Condom Use in Malawi

Kpoti Kitissou and Bong Joon Yoon*

ABSTRACT

Knowledge of HIV status can be an important deterrent to the transmission of the virus. Yet in Africa, a large proportion of individuals are unaware of their HIV status. We analyze the demand for voluntary HIV testing. We focus on the relationship between condom use and voluntary HIV testing. In doing so, we observe how different degrees of condom use are associated with HIV testing. Results show that condom use is complementary to voluntary HIV testing. We also find the demand for HIV testing diminishes with the consistency of condom use.

INTRODUCTION

This paper analyzes the demand for HIV testing using data from the Malawi Demographic and Health Survey of 2010 and attempts to bridge the research on condom use and HIV testing. Whereas others have focused on the demand for HIV testing through observing incentives for HIV testing, such as stipends and provision of free antiretroviral therapy, we focus on the characteristics of those who demand HIV testing with condom use as our main characteristics identifier.

Sub-Saharan Africa hosts approximately 70 percent of the 36.7 million individuals living with HIV/AIDS (UNAIDS 2016). Life expectancy without antiretroviral therapy upon contracting HIV is ten years. Individuals most affected by HIV are those in their productive years in the labor market. The new millennium began with the HIV epidemic being declared a "natural disaster" (R. Thornton 2008). With the Millennium Development Goals came a greater emphasis on HIV prevention education, increased governmental resource allocation toward health sectors, and increased participation by Non-Governmental Organizations (NGOs). Central to the recent successes in curtailing the HIV epidemic is the promotion of low-cost HIV testing and antiretroviral therapy, in addition to promoting condom use and general HIV prevention knowledge.

Globally, there were 700,000 fewer new infections in 2011 than in 2001 (UNAIDS 2012b). Malawi has been incredibly successful with a 73 percent decline in new infections during the same period. In 2003 Malawi introduced the National HIV and AIDS Policy with the objectives of reducing HIV infections, improving treatment, and mitigating the social stigma of the disease. More recent programs such as the Malawi Growth and Development Strategy initiatives and the National Strategic Plan have further emphasized the importance of curtailing the epidemic with the aim of reducing new infections by 20 percent and HIV related deaths by 8 percent by 2016. HIV prevalence in Malawi has decreased steadily from a prevalence rate of 16.4 in 1999 to a 10 percent prevalence rate in 2011 (UNAIDS 2012a).

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Overall prevention methods emphasize the ABCs: Abstaining, Being faithful, and consistent use of Condoms. Recently, HIV status awareness and counseling have received increasing emphasis (Angotti et al. 2009). Having knowledge of HIV status and counseling is based on the premise that on average individuals who find they have HIV behave altruistically post-test (Boozer and Philipson 2000; Mechoulan 2004; Gersovitz 2011; Gong 2015; Wilson 2016), and choose to be less promiscuous, use more condoms, or use antiretroviral therapy. Gong (2015) provides some evidence that testing has led to declines in new infections in Kenya, Zambia, and Mozambique because testing leads to antiretroviral therapy.

HIV status awareness in sub-Saharan Africa has dramatically increased since the beginning of the millennium, although awareness is still low. At the end of 2011, only half of infected individuals were aware of their status (UNAIDS 2012b; WHO 2013). Principally, the lack of HIV status awareness is the result of the stigma associated with the virus, treatment of test takers, availability of testing centers, cost of testing, and availability of antiretroviral therapy (UNAIDS 2012a; Obermeyer et al. 2013). However, over time these barriers are diminishing.

The cost of testing for HIV has fallen dramatically such that testing is now mostly free because of governmental budget allocations and the help of NGOs (Angotti et al. 2009). The availability of door-to-door and mobile HIV testing has also reduced the time and distance cost of test taking for individuals in poor rural areas. Although the increase in HIV testing is attributed to the destigmatization of HIV initiatives and accessibility, it can also be argued that it is due to improvements in the allocation of HIV treatments (UNAIDS 2012b). Also, the availability of highly subsidized HIV treatment gives individuals an incentive to partake in HIV testing as antiretroviral therapy prolongs life and reduces the chance of infecting others (Wilson 2016). However, retention in HIV treatment programs is not high. In Malawi, for example, nearly half of the people who begin treatment are no longer in care five years later (UNAIDS 2012b). Nevertheless, HIV testing can serve as an important deterrent to the spread of HIV.

The objective of this paper is to examine the impact of condom use on the demand for HIV testing in Malawi. In estimating the demand for HIV testing, we focus on males age 15-24, as their actions shape the future of HIV across the world (UNAIDS 2012b). In doing so, we emphasize how related goods—whether complements or substitutes such as condom use—influence the decision to be tested.

Aside from being faithful or abstaining, condom use is the most effective method of preventing HIV contraction for the sexually active. The usage of condoms has two public health outcomes: the prevention of pregnancy and the prevention of sexually transmitted diseases (STD), (UNFPA 2010). Also, if condom use is altruistic, it can prevent future infections post-HIV test. Condom use can also signify the user is risk averse. Risk aversion may also increase the demand for HIV testing. However, self-selection into HIV testing and condom use may be confounded in measurement. That is, although frequent condom users may be risk averse, condom use can either be a complement or a substitute for HIV testing. Thus, an individual may be risk averse but may not demand an HIV test if condom use is a substitute for HIV testing.

Empirically, we determine whether condom use is a complement or a substitute for HIV testing by observing different degrees of condom usage. We are unaware of any other studies that estimate how various degrees of condom usage affect the demand for HIV testing while also controlling for condom use as an endogenous variable. Our result shows that in general condom use is complementary to HIV testing. But the degree of complementarity declines with the intensity of condom use which is also a measure of risk aversion. That is, extremely risk averse people tend to have less demand for testing than moderately risk averse people. Hence, we suspect that condom use and HIV testing are less complementary among extremely risk averse people. In other words, condom use becomes more of a substitute for HIV testing when condoms are used consistently.

The rest of the paper is organized as follows: a literature review, discussion of our conceptual framework, data, an empirical model with results, and a conclusion.

Literature Review

There is a limited but growing literature on the demand for HIV testing and sexual behavior. Two strands of the literature exist, with one focused on the determinants of HIV testing and the other on sexual behavior post-HIV testing. Of the determinants of HIV testing it has been generally acknowledged that education, wealth, stigma, risk perception, and HIV knowledge are the primary determinants (Ford et al. 2004; Glick and Sahn 2007; Haile, Chambers, and Garrison 2007; Sambisa, Curtis, and Mishra 2010; Gersovitz 2011; Tenkorang and Maticka-Tyndale 2013; Lépine, Terris-Prestholt, and Vickerman 2014). Our research relates to risk perception and HIV testing, where those who view themselves at high risk of infection are found to be more likely to engage in testing. Risk perception in the literature has generally been measured by a self-identified ranking of the likelihood of HIV infection, promiscuous behavior, condom use, and knowledge of someone who has been infected or died of HIV. However, little attention has been given to the extent to which condom usage is associated with HIV testing. We address this issue in our paper. Of the works that focus on sexual behavior post-HIV testing, most find that HIV testing reduces sexual behavior for those who test positive and to some extent increases condom use (Marks et al. 2005; R. L. Thornton 2008, 2012; Delavande and Kohler 2012; Rosenberg et al. 2017).

The recent waves of research have focused on how exogenous factors influence the decision to test for HIV. R. L. Thornton (2008) uses data from the Malawi Diffusion and Identical Change Project to examine the relationship between HIV testing and result retrieval. In this study design, individuals were given randomized vouchers ranging between 0 to 3 dollars with an average payment of 1.01 dollars (approximately a day's wage) if results were retrieved. She finds the voucher incentive to be positively associated with result retrieval, suggesting that fear of knowing one's HIV status can be mitigated by a small voucher. She also finds that those who tested positive for HIV were, nevertheless, less likely to retrieve their results. Most importantly, she also finds HIV positive individuals were significantly more likely to purchase subsidized condoms; however, reduction in the number of sexual partners was insignificant post-HIV result.

Sood, Wagner, and Wu (2015) using United States data from the Behavioral Surveillance System finds that the expansion of insurance through increased Medicaid funding provided greater incentives for HIV testing due to better access to newly developed HIV treatment drugs. Their results suggest that subsidizing treatment is also effective in encouraging testing. Similarly to Sood Wagner, and Wu (2015), Wilson (2016) using data from the Zambia Sexual Behavior Survey finds increased accessibility to antiretroviral therapy due to subsidies in the mid-2000s is positively associated with the demand for HIV testing. However, he also finds that older men who are less at risk of HIV infection are more likely to seek treatment than men in the younger cohorts. Thus, the antiretroviral therapy policy in Zambia has modest benefits.

Our paper primarily relates to R. L. Thornton (2008) but extends the literature in identifying how condom usage influences the decision to test. Therefore, we do not focus on the exogenous incentivization of HIV testing but rather on the characteristics of individuals who demand HIV testing.

CONCEPTUAL FRAMEWORK

Assuming condom use is altruistic, HIV testing has the potential to significantly curtail new HIV infection rates if it leads to a sustained increase in antiretroviral therapy treatment, greater condom use, and a reduction in promiscuous behavior. However, the altruistic behavior depends on preferences, the shock of the testing information, and post-test behavior. For example, Boozer and Philipson (2000) show that individuals who had a high prior belief they were infected but discovered themselves to be HIV negative increased their number of partners. They also find that those who were shocked by a positive HIV result reduced their number of partners. Gong (2015) finds that those who were shocked by a positive HIV result increased their risky behavior measured by the likelihood of having an STD, whereas those shocked by a negative result reduced risky behavior. Similarly to Gong (2015), Paula, Shapira, and Todd (2014) find that those who revised their likelihood of infection downward after testing reduced their sexual activity. Differences in these studies depend on the datasets used. Boozer and Philipson (2000) use data from the San Francisco Home Health Study from 1988-1989, Gong (2015) uses data from Kenya and Tanzania in the HIV Voluntary Counseling and Testing Efficacy from 1995-1996, and Paula, Shapira, and Todd (2014) use data from the Malawi Diffusion and Ideational Change Project from 2004-2006.

We assume individuals maximize their expected utility given the likelihood of HIV infection with respect to their desire for condom use and HIV testing.

$$EU = u(\bar{C}) * EV(Health) \tag{1}$$

$\bar{C}$, the unwillingness to use a condom, is given by $\bar{C} = 1 - C$ where C is the degree of condom use with $C \in [0,1]$. T denotes the likelihood for testing for HIV, $T \in (0,1]$. $EV(Health)$ represents the expected value of health or lifespan. Assuming that individuals take antiretroviral therapy only if they test positive[1],

$$EV(Health) = T * [\widetilde{D}\delta + \bar{D}(1-\delta)] \; + \; (1-T) * [D\delta + \bar{D}(1-\delta)], \quad (2)$$

where $\widetilde{D}$ is the lifespan with antiretroviral therapy if infected, D the lifespan without antiretroviral therapy if infected, and $\bar{D}$ the lifespan if not infected. Thus, D < $\widetilde{D} < \bar{D}$. The probability of HIV infection, $\delta = \delta(\beta, \theta, \bar{C})$, where β is the local HIV prevalence rate, and θ is the transmission rate of HIV. The optimization with respect to *T* and $\bar{C}$ is summarized by

$$\max_{T,\bar{C}} \; EU\,(T, \bar{C}) = u(\bar{C}) * \{T * [\widetilde{D}\delta(\bar{C}) + \bar{D}(1-\delta(\bar{C}))] \; + \; (1-T) \; * [D\delta(\bar{C}) + \bar{D}(1-\delta(\bar{C}))]\},$$

where $u'(\bar{C})$>0 and $\delta'(\bar{C}) > 0$.

Obviously, the optimal levels of *T* and $\bar{C}$ are determined where their marginal benefit equals their marginal cost. Since the analytical solutions for the optimization are difficult to derive without excessive assumptions, we approach their determination using empirical results.

Empirically, our main interest is the relationship between condom use and HIV testing. Risk aversion comes in two forms in our analysis: testing for HIV and frequency of condom use to prevent an STD or HIV. We thus can assess which form of risk aversion dominates. We will account for endogeneity of condom use in HIV testing. Since condom use and HIV testing are highly subsidized, we use latent variable representations to estimate whether they are substitutes or complements. This approach is somewhat similar to Dinardo and Lemiuex (2001), which examined whether alcohol consumption and marijuana use are complements or substitutes among American youths.

THE DATA

We focus on Malawi's 2010 Demographic and Health Survey because it provides data on the variables in which we are interested. The Demographic and Health Surveys are nationally representative household surveys with a wide range of information on sexual behavior, health, nutrition, reproduction, and HIV status. The behavior of young adults, age 15-24, can have a major impact on the epidemic since a reduction in their infection rates of HIV can be beneficial to future cohorts. We focus specifically on the male cohort age 15-24 whose demand for condom use we expect to influence decisions of HIV testing. Our use of a male sample is because the condom variable in the Malawi's Demographic and Health Survey is for male condoms. Female condoms tend not to be as easily accessible as male condoms (UNFPA 2010), and there are fewer data available.

Further, we focus only on those who do not have potentially long-lasting relationships because these individuals are more at risk of HIV infection than those who are married or in a long-term monogamous relationship. Thus, our sample consists of males between the age of 15-24, who were not married when the survey was taken and had sexual intercourse.

Table 1 presents the variables of interest in our study. Twenty seven percent of the sample have requested an HIV test, 33.5 percent tested for HIV in the 12 months prior to the survey, and 47.9 percent have tested for HIV during their lifetime. The retrieval rate of HIV test results is high at 98.6 percent. We also find that 58 percent of our sample had multiple partners in the 12 months prior to the survey and 1.6 percent have HIV. We observe that roughly one-third of the sample claims to use condoms consistently

measured by *Condom Every Time*, which contains individuals who stated that they used condoms in every sexual act with at least one of their last three partners in the twelve months prior to the survey. Comparatively, we have a weak measure for condom use called *Condom Recent,* which includes individuals who report that they have used condoms in the last few months prior to the survey. Frequency or consistency of condom use would then reside in our measure *Condom Every Time*. Regarding other measures for condom use, we find that only 30 percent of the individuals used condom at first sex and 5.6 percent claim not to have access to condoms. With these figures, a major concern in the prevention of HIV is the attitude toward condom use and its lack of consistent use (Green et al. 2009). Table 1 also shows that the incidence of HIV prevalence varies by region in Malawi with the southern region experiencing an 11.1 percent infection rate, the central region a 6.8 percent infection rate, and the northern region a 5.3 percent infection rate.

Table 1. Summary Statistics: Variable Definitions

Variables	Definition	Mean	Min	Max	Sample
Asked for HIV Test *	=1 if asked for last HIV test	0.270	0	1	1523
Tested 12 Months*	=1 if tested 12 months prior to the survey	0.335	0	1	1530
Ever Tested for HIV*	= 1 if ever test for HIV	0.479	0	1	1531
Condom Recent	=1 if currently using condoms	0.297	0	1	1531
Condom Every Time*	=1 if used condoms every time with at least one of last three partners	0.312	0	1	1118
Condom at First Sex	=1 if used condom at first sexual intercourse	0.301	0	1	1513
Condom Source No	=1 if has no knowledge of a condom source	0.056	0	1	1531
Got HIV Result	=1 if got last HIV test result	0.986	0	1	734
HIV Status	=1 if has HIV	0.016	0	1	1404
Family Planning Radio	=1 if heard of family planning on Radio	0.712	0	1	1531
Family Planning TV	=1 if heard of family planning on TV	0.201	0	1	1531
Family Planning News	=1 if heard of family planning in Newspaper	0.381	0	1	1530
Has Extra Partner	=1 if has at least 1 additional partner	0.580	0	1	1528
Has STD	=1 if has a sexually transmitted disease in the last 12 months	0.013	0	1	1518
Circumcised	=1 if circumcised	0.214	0	1	1531
Education	Number of years of education	6.4	0	15	1531
Rural	=1 if reside in a rural setting	0.829	0	1	1531
Head of HH or Son of HH	=1 if head of the household or son of the head of household	0.615	0	1	1531
2nd Wealth Quintile	=1 if Household belongs in the 20-40 wealth percentile	0.184	0	1	1531
3rd Wealth Quintile	=1 if Household belongs in the 40-60 wealth percentile	0.185	0	1	1531
4th Wealth Quintile	=1 if Household belongs in the 60-80 wealth percentile	0.223	0	1	1531
5th Wealth Quintile	=1 if Household belongs in the 80-100 wealth percentile	0.257	0	1	1531
Northern Region	=1 if resides in the Northern Region	0.133	0	1	1531
Central Region	=1 if resides in the Central Region	0.378	0	1	1531
Southern Region	=1 if resides in the Southern Region	0.489	0	1	1531
Age	Current age of respondent when survey was taken, all respondents are 15 or older	18.9	15	24	1531
Northern Region Prev.	Northern Region HIV prevalence rate	5.3%			
Central Region Prev.	Central Region HIV prevalence rate	6.8%			
Southern Region Prev.	Southern Region HIV prevalence rate	11.1%			

*Asked for HIV Test is coded as 1 for those who asked for their last HIV test and 0 for those who never tested for HIV (DHS variable code v781 == 0). Tested 12 Months is coded added as 1 for those who tested for HIV 12 months prior to the survey and 0 for those who never tested for HIV (DHS variable code v781 == 0). Condom Every Time is coded 1 for those who have used condoms every single time they have had a sexual act and 0 for those who never used condom (DHS variable code v305 == 0). Our sample relates to males who are between the age of 15-24 (DHS variable code v012), who are single or divorced (DHS variable code v502) and experience sexual intercourse (DHS variable code v525).

Table 2 presents descriptive comparative statistics of those who asked and did not ask for HIV testing, those who have HIV, and those who used *Condom Recent*. For the remainder of this paper, we employ whether the individual asked for an HIV test as our main identifier for the demand for HIV testing. Among those who have asked for an HIV test, 71.8 percent were tested in the 12 months prior to the survey, and 99.3 percent received their HIV result (Table 2, Column 2). The main difference between the measures of those who asked to be tested and those who were tested in the 12 months prior to the survey for HIV is time. Also, individuals who asked to be tested are more likely to have additional partners at 64.4 percent (Table 2, Column 2) compared to 55.5 percent for those who never asked for an HIV test. Similarly, those who asked for an HIV test have more years of education with 7.1 years of schooling as compared to 6.2 for those who never asked, and they also have a higher rate of condom use. Concerning those who have HIV, we observe that these individuals have roughly the same rate of condom use as those who asked to be tested (Table 2, Column 2 and 4).

Table 2. Comparative Statistics

	Regression Sample		Ask for HIV Test		Did not Ask for HIV Test		Has HIV		Condom Recent	
	(1)		(2)		(3)		(4)		(5)	
	Obs.		*Obs.*		*Obs.*		*Obs.*		*Obs.*	
Asked for HIV Test	1523	27.0%	411	100%	1112	0%	23	17.4%	450	35.6%
Test 12 months+	1530	33.5%	411	71.8%	1112	19.2%	23	26.1%	455	47.0%
Condom Recent	1531	29.7%	411	38.9%	1112	26.1%	23	39.1%	455	100%
Condom Every Time	1118	31.2%	283	45.6%	828	26.4%	18	44.4%	445	72.1%
Condom at First Sex	1513	30.1%	407	40.5%	1099	26.2%	21	33.3%	454	48.0%
Condom Source No	1531	5.6%	411	1.7%	1112	7.0%	23	0%	455	1.8%
Got HIV Result	734	98.6%	411	99.3%	315	97.8%	12	100%	278	99.6%
HIV Status	1404	1.6%	374	1.1%	1022	1.9%	23	100%	419	2.1%
Has Extra Partner	1528	58.0%	410	64.4%	1110	55.5%	23	69.6%	455	99.3%
Has STD	1518	1.3%	409	1.5%	1101	1.2%	23	4.3%	452	1.1%
Circumcised	1531	21.4%	411	17.3%	1112	22.7%	23	26.1%	455	18.5%
Education	1531	6.4	411	7.2	1112	6.2	23	6.8	455	6.9
Rural	1531	82.9%	411	82.0%	1112	83.2%	23	65.2%	455	80.7%
Northern Region	1531	13.3%	411	15.3%	1112	12.5%	23	8.7%	455	17.6%
Central Region	1531	37.8%	411	36.3%	1112	38.2%	23	26.1%	455	39.1%
Southern Region	1531	48.9%	411	48.4%	1112	49.3%	23	65.2%	455	43.3%

*Regression sample relates to males who of age 15-24, had sex and are single or divorced. Columns 2-5 are subsamples of the regression sample. The main difference between Tested 12 Months and Asked for HIV Test is time. Some individuals tested before the 12 months criteria.

EMPIRICAL MODEL AND RESULTS

We employ a Linear Probability Model to estimate the demand for HIV testing measured by whether the individual asked to be tested for HIV and whether the individual took an HIV test in the 12 months prior to the survey[2]. Our Model is:

$$Tested_i = \beta_0 + \beta_1 Education_i + \beta_X' X_i + u_i, \quad (3)$$

where $Tested_i$ represents our two measures for HIV testing. $Education_i$ represents the individual's years of education. X_i represents the individual's region of residence, household wealth quintile, and age dummies.

We are especially interested in the relationship between condom use and HIV testing. Condom use may either be a complementary or a substitute good for HIV testing. Also, frequency differences in condom use can signify the degree of risk aversion. Therefore, to capture the relationship between condom use and HIV testing, our model is re-specified as:

$$Tested_i = \alpha_0 + \alpha_1 Condom_i + \alpha_2 Education_i + \alpha_X' X_i + e_i, \quad (4)$$

where $Condom_i$ represents *Condom Recent* or *Condom Every Time*, with the latter serving as our measure of the degree of risk aversion. The magnitude of the impact of condom use on the demand for HIV testing may vary with the individual's degree of risk aversion.

We suspect that condom use has its own demand function and is therefore endogenous. To avoid endogeneity bias, we re-estimate equation (4) using an instrumental variables approach where the first stage equation is:

$$Condom_i = \gamma_0 + \gamma_1 Condom\ First\ Sex_i + \gamma_2 No\ Condom\ Source_i + \gamma_3 Education_i + \gamma_X' X_i + v_i, \quad (5)$$

where the identifying instruments are $Condom\ First\ Sex_i$ and $No\ Condom\ Source_i$. $Condom\ First\ Sex_i$ represents whether the individual used a condom at his first sexual intercourse and $No\ Condom\ Source_i$ represents whether the individual knows of an available source for condoms. These two instruments were chosen after several validation tests among a myriad of potential variables using the Wu-Hausman Specification Test, the first stage F-test, and the Sargan overidentification test. We do not expect whether the individual used a condom at his first intercourse to necessarily influence his current demand for HIV testing. This is due to the time gap in information and the two benefits of condom use for pregnancy prevention and protection from HIV infection. In addition, we suspect those who use a condom at first intercourse to be likely to use condoms in future sexual acts. We choose $No\ Condom\ Source_i$ as the additional instrument as it is exogenous to the choice of using condom. We believe the exogenous nature of $No\ Condom\ Source_i$, which measures the availability of condoms, will have an important influence on the consistency of condom use. Also, not knowing a ready source of condoms will not necessarily influence the ability to test for HIV as testing is readily available through mobile clinics. Although it could be argued that access to a mobile clinic may lead to condom availability $No\ Condom\ Source_i$ relates to the consistent availability of condoms.

DEMAND FOR HIV TESTING

Table 3 column 1 and 2 present the results from estimating equation (3). We find that education has a positive and statistically significant impact on the demand for HIV testing. This is not surprising as educated individuals will be more aware of the benefits of testing for HIV in addition to having a greater loss of welfare if infected. The same argument can be applied to wealth or the income effect. We expect wealth to be positively and significantly associated with HIV testing given the opportunity cost of contracting HIV.

However, both of our measures for the demand for HIV testing indicate an insignificant relationship. There are three possible explanations for the insignificance of wealth. First, our wealth measure is household wealth and hence is not indicative of personal wealth. Second, education can mitigate the influence of wealth on HIV testing. When we exclude education from the regression, individuals belonging to the wealthier household quintiles had positive and significant coefficients on the demand for HIV testing. Lastly, because HIV testing is highly subsidized, wealth may not have an influence on the demand for HIV testing. Rural residence has a significant and positive effect on being tested in the 12 months prior to the survey. This result at first is surprising; however, it may be due to greater availability of mobile clinics for HIV testing and because most Malawians with HIV reside in rural areas (Kim et al. 2016, 2); 83 percent of the individuals in our sample reside in rural areas. We also do not find any significant relationship between those who have asked for an HIV test and rural residency.

Table 3. Asked for HIV test and test for HIV 12 months prior to the survey with Socioeconomic Variables

	Asked for HIV Test	Tested 12 Months	Asked for HIV Test	Tested 12 Months	Asked for HIV Test	Tested 12 Months
	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Condom Recent			0.097***	0.154***		
			(0.025)	(0.026)		
Condom Every Time					0.140***	0.161***
					(0.028)	(0.030)
Education	0.030***	0.037***	0.028***	0.034***	0.027***	0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Rural	0.024	0.110***	0.023	0.108***	0.027	0.122***
	(0.035)	(0.037)	(0.035)	(0.036)	(0.041)	(0.043)
2nd Wealth Quintile	0.016	-0.023	0.0153	-0.024	0.018	-0.008
	(0.039)	(0.041)	(0.039)	(0.040)	(0.044)	(0.047)
3rd Wealth Quintile	-0.008	0.011	-0.011	0.006	0.026	0.024
	(0.039)	(0.041)	(0.039)	(0.040)	(0.044)	(0.047)
4th Wealth Quintile	0.0413	0.051	0.035	0.041	0.048	0.076*
	(0.038)	(0.040)	(0.038)	(0.039)	(0.042)	(0.045)
5th Wealth Quintile	-0.023	0.035	-0.029	0.024	-0.048	0.036
	(0.042)	(0.043)	(0.041)	(0.043)	(0.047)	(0.050)
Age 20-24	0.055**	0.102***	0.048**	0.091***	0.044	0.066**
	(0.024)	(0.025)	(0.024)	(0.024)	(0.028)	(0.030)
Central Region	-0.010	-0.009	-0.007	-0.002	-0.035	-0.051
	(0.037)	(0.038)	(0.036)	(0.038)	(0.042)	(0.0450)
Southern Region	-0.014	-0.041	-0.005	-0.026	-0.030	-0.060
	(0.035)	(0.037)	(0.035)	(0.037)	(0.041)	(0.043)
Constant	0.042	-0.030	0.025	-0.056	0.020	-0.023
	(0.052)	(0.069)	(0.066)	(0.068)	(0.075)	(0.080)
Observations	1,523	1,530	1,523	1,530	1,111	1,117
R-squared	0.035	0.064	0.045	0.085	0.061	0.083
Sample	Age 15-24, Had Sex, and Single or Divorce					
	Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1					

Our main interest is the relationship between condom use and the demand for HIV testing. In columns 3-6 of Table 4, we estimate equation (4). Here we employ our two measures for the demand for HIV testing with our two measures of condom use. We find both condom measures to be positively and significantly

associated with the demand for HIV testing, suggesting that condom use, in general, is a complementary good to HIV testing. The result also indicates that demand for HIV testing increases with the frequency of condom use, measured by *Condom Every Time*. As stated previously, the single equation estimation of the demand for HIV testing in regards to condom use may be biased because of endogeneity in condom use.

DEMAND FOR HIV TESTING AND INSTRUMENTATION

Since condom use has its own demand function, we estimate the demand for HIV testing as a two-stage least square regression using the demand for condoms as the first stage equation. Table 4 show results for both of our condom use measures. The estimated first stage and second stage regressions relating to individuals of *Condom Recent* and those who asked for an HIV test are displayed in columns 1 and 2. Columns 3 and 4 show the first stage and second stage regressions of those of *Condom Recent* and those who tested in the 12 months prior to the survey. In both first stage regressions, using condom at first sex is positively and significantly associated with *Condom Recent* and not knowing a source for condoms is negatively and significantly associated with *Condom Recent*, as expected.

Table 4. IV regressions: Asked for HIV test, test for HIV 12 months prior to the survey, and condom use

	Condom Recent	Asked for HIV Test	Condom Recent	Tested 12 Months	Condom Every Time	Asked for HIV Test	Condom Every Time	Tested 12 Months
	First Stage	*Second Stage*	*First Stage*	*Second Stage*	*First Stage*	*Second Stage*	*First Stage*	*Second Stage*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Condom Recent		0.520***		0.504***				
		(0.117)		(0.116)				
Condom Every Time						0.315***		0.357***
						(0.076)		(0.081)
Condom at First Sex	0.221**		0.225***		0.383***		0.384***	
	(0.025)		(0.025)		(0.029)		(0.029)	
No source for Condom	-0.123***		-0.124**		-0.143***		-0.143***	
	(0.051)		(0.051)		(0.055)		(0.051)	
Education	0.010**	0.021***	0.010**	0.028***	0.011**	0.023***	0.011**	0.026***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Rural	0.007	0.020	0.013	-0.103***	-0.017	0.029	-0.019	0.125***
	(0.036)	(0.038)	(0.035)	(0.039)	(0.040)	(0.041)	(0.040)	(0.044)
Central Region	-0.053	0.017	-0.056	0.027	-0.031	-0.024	-0.031	-0.029
	(0.037)	(0.040)	(0.037)	(0.041)	(0.042)	(0.044)	(0.042)	(0.046)
Southern Region	-0.090**	0.044	-0.091**	0.022	-0.079**	-0.005	-0.079**	-0.022
	(0.036)	(0.041)	(0.036)	(0.041)	(0.041)	(0.043)	(0.041)	(0.045)
Constant	0.179***	-0.057	0.176***	-0.127*	0.163**	-0.193	0.168**	-0.074
	(0.068)	(0.075)	(0.067)	(0.075)	(0.076)	(0.077)	(0.075)	(0.083)
Observations	1,506	1,506	1,512	1,512	1,096	1,096	1,101	1,101
R-squared	0.088		0.089		0.201	0.030	0.201	0.050
Wu-Hausman F-test		16.633		10.829		6.241		6.864
		p = 0.000		p = 0.001		p = 0.012		p = 0.009
First-Stage F-test		42.879		44.393		90.791		91.874
		p = 0.000		p =0.000		p = 0.000		p =0.000
Sargan Chi-2		1.297		0.015		1.902		0.034
Overidentification Test		p = 0.255		p = 0.902		p = 0.170		p = 0.854
Sample	Age 15-24, Had Sex, and Single or Divorce							
	Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1							

*Coefficients from household wealth and cohort dummy variables not shown and are available upon request. The household wealth coefficients are all insignificant, whereas coefficients for those aged 20-24 are generally significant at the 5% and 1% level.

Coefficients relating to a region of residence seem to indicate those in the southern region of Malawi on average are 9 percent less likely to use condoms. This is worrying as the southern region of Malawi has a comparatively higher HIV infection rate of 11.1 percent (Table 1). Conversely, it may be that the lack of condom use is associated with a higher HIV prevalence rate.

Given that different regions of Malawi have different HIV infection rates we further investigate variations in condom use and HIV testing by using region and residence type interactions. For example, our regression results suggest that HIV testing is likely to be more prominent in rural areas but insignificant in the determination of condom use. The interaction between region and residence type are displayed in Table 5. We find that condom use is generally not prevalent in either the rural or the urban parts of southern Malawi. Regional coefficients for HIV testing were previously insignificant in Table 4. But using our interactions method, we find that those residing in the urban areas of the southern region of Malawi are between 11 to 18 percent less likely to Test for HIV. This is of concern as HIV prevalence is typically higher in urban areas (TCE Malawi n.d.). Hence, not only are the southern residents of Malawi unlikely to test for HIV they are also unlikely to use condoms.

Table 5. IV regressions with region by residence dummies

	Condom Recent	Asked for HIV Test	Condom Recent	Tested 12 Months	Condom Every Time	Asked for HIV Test	Condom Every Time	Tested 12 Months
	First Stage	*Second Stage*	*First Sage*	*Second Stage*	*First Stage*	*Second Stage*	*First Stage*	*Second Stage*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Condom Recent		0.520***		0.504***				
		(0.116)		(0.115)				
Condom Every Time						0.315***		0.357***
						(0.076)		(0.081)
Condom at First Sex	0.221***		0.224***		0.384***		0.384***	
	(0.025)		(0.025)		(0.029)		(0.029)	
No source for Condom	-0.124**		-0.124**		-0.145***		-0.146***	
	(0.051)		(0.051)		(0.055)		(0.055)	
Education	0.010**	0.020***	0.010**	0.027***	0.011*	0.023***	0.011*	0.026***
	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Rural x Central Region	-0.046	-0.001	-0.049	0.023	-0.022	-0.031	-0.022	-0.034
	(0.038)	(0.042)	(0.038)	(0.042)	(0.043)	(0.045)	(0.043)	(0.048)
Rural x Southern Region	-0.092**	0.048	-0.093**	0.045	-0.085**	-0.004	-0.085**	0.001
	(0.037)	(0.042)	(0.037)	(0.042)	(0.042)	(0.044)	(0.042)	(0.047)
Urban x Central Region	-0.091	0.098	-0.100*	0.017	-0.078	0.003	-0.080	-0.036
	(0.594)	(0.065)	(0.059)	(0.065)	(0.070)	(0.072)	(0.069)	(0.076)
Urban x Southern Region	-0.083*	0.010	-0.088*	-0.116**	-0.047	-0.027	-0.043	-0.178***
	(0.049)	(0.054)	(0.049)	(0.054)	(0.056)	(0.057)	(0.055)	(0.061)
Constant	0.185***	-0.030	0.1860***	-0.033	0.145**	0.013	0.149**	0.043
	(0.054)	(0.061)	(0.054)	(0.061)	(0.061)	(0.062)	(0.061)	(0.066)
Observations	1,506	1,506	1,512	1,512	1,096	1,096	1,101	1,101
R-squared	0.202		0.090		0.201	0.030	0.202	0.053
Wu-Hausman F-test		16.634		10.761		6.231		6.721
		p = 0.000		p = 0.001		p = 0.013		p = 0.010
First-Stage F-test		42.855		44.347		90.998		92.065
		p = 0.000		p = 0.000		p = 0.000		p = 0.000
Sargan Chi-2		1.285		0.036		1.866		.0079
Overidentification Test		p = 0.257		p = 0.850		p = 0.172		p = 0.929
Sample	Age 15-24, Had Sex, and Single or Divorce							
	Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1							

*Coefficients from household wealth and cohort dummy variables not shown and are available upon request. The household wealth coefficients are all insignificant, whereas coefficients for those aged 20-24 are generally significant at the 5% and 1% level.

In Table 4, our coefficient of interest in the second stage regression for our measures for the demand for HIV testing suggests that condom use is positively and significantly related to the demand for HIV testing. These coefficients are larger than those of our single equation model in Table 3. Unlike our single equation method, we find frequent condom use reduces the desire for HIV testing. *Condom Recent*, our weak measure for condom use, is associated with a 52 percent chance of asking for HIV testing. For *Condom Every Time* we find the likelihood of asking for an HIV test is 31.5 percent. A similar pattern is also observable for those who tested for HIV in the 12 months prior to the survey. These results are also consistent in our extended model that introduced the interaction between region and residence type, Table 5.

These results suggest that the positive effect of condom use on HIV testing diminishes with the intensity of condom use. Risk aversion can be viewed in two forms in our work. The first is the desire to test frequently for HIV status awareness and the second is the desire to use condoms to avoid infection. Our result indicates risk aversion leads to frequent condom use, all else held equal. The result also suggests that condoms are a complementary good to HIV testing. However, the complementarity declines with condom use frequency: the added safety of using condoms seems to reduce the perceived need for HIV testing.

ROBUSTNESS MEASURES

For robustness, we control for sexual behavior measured by whether the individual had at least two partners or an STD in the 12 months prior to the survey, whether the individual is circumcised, and a household fixed effect which depends on whether the individual is the head of his household or a child of the head of his household. Results are displayed in Table 6. Because sexual behavior influences the desire to test for HIV we employ it to observe its explanatory significance in the determination of the condom effect on HIV testing. Our measures for STD and circumcision are similar in spirit. Circumcision may affect the demand for testing as circumcised individuals have a lower probability of infection. For our household fixed effect measure, we believe unobservable characteristics of the individual can be captured by the individual's family background. For example, household specific attributes may encourage risk aversion or serve as protection for risk takers.

We find overall that promiscuous behavior is positively and significantly associated with condom use in the first stage regression. The positive association with risky sexual behavior and condom use is expected given that condoms protect from the risk of sexual behavior and pregnancy. Concerning STD, we find it to have a negative and significant relationship to our weak measure for condom use. With our stronger measure of condom use, we find an insignificant relationship, providing evidence in our measure for condom frequency. We find individuals who are circumcised are less likely to use condoms. Given that circumcision is associated with a lower likelihood of HIV infection this observation is not surprising. This is also worrying since circumcision does not prevent HIV infection. However, using Kenyan data, Wilson, Xiong, and Mattson (2014) find that circumcision is not positively associated with risky sexual behavior, as

circumcised males do not necessarily believe they have a lower likelihood of HIV infection. Regarding our household fixed effect, we find insignificant results. Hence unobserved household characteristics do not affect the decision to use condoms or test for HIV. In other words, an individual's family situation does not necessarily influence his private decisions on condom use and HIV testing.

Table 6. IV regressions with additional control variables

	Condom Recent	Asked for HIV Test	Condom Recent	Tested 12 Months	Condom Every Time	Asked for HIV Test	Condom Every Time	Tested 12 Months
	First Stage (1)	*Second Stage* (2)	*First Stage* (3)	*Second Stage* (4)	*First Stage* (5)	*Second Stage* (6)	*First Stage* (7)	*Second Stage* (8)
Condom Recent		0.510***		0.498***				
		(0.119)		(0.119)				
Condom Every Time						0.322***		0.366***
						(0.096)		(0.102)
Condom at First Sex	0.216***		0.218***		0.310***		0.310***	
	(0.021)		(0.021)		(0.027)		(0.027)	
No source for Condom	-0.102**		-0.102**		-0.128**		-0.128**	
	(0.042)		(0.042)		(0.0450)		(0.050)	
Has another Partner(s)	0.513***	-0.187***	0.514***	-0.154**	0.413***	-0.041	0.412***	-0.031
	(0.019)	(0.066)	(0.019)	(0.067)	(0.025)	(0.052)	(0.025)	(0.056)
Has STD	-0.171**	0.122	-0.171**	0.126	-0.073	0.042	-0.072	0.014
	(0.084)	(0.110)	(0.084)	(0.112)	(0.101)	(0.117)	(0.101)	(0.125)
Circumcised	-0.061**	-0.024	-0.061**	-0.008	-0.063**	-0.050	-0.068**	0.012
	(0.024)	(0.032)	(0.024)	(0.032)	(0.029)	(0.034)	(0.029)	(0.037)
Head HH or Son of HH	0.032	0.0078	0.034*	-0.032	0.011	0.012	0.015	-0.011
	(0.020)	(0.025)	(0.020)	(0.026)	(0.024)	(0.028)	(0.024)	(0.030)
Education	0.011**	0.020***	0.011**	0.028***	0.011**	0.022***	0.010**	0.027***
	(0.004)	(0.006)	(0.004)	(0.006)	(0.005)	(0.0062)	(0.005)	(0.007)
Rural	-0.012	0.025	-0.008	0.108***	-0.024	0.026	-0.026	0.127***
	(0.029)	(0.038)	(0.029)	(0.038)	(0.036)	(0.042)	(0.036)	(0.044)
Central Region	-0.035	0.012	-0.038	0.025	0.000	-0.021	0.002	-0.029
	(0.031)	(0.040)	(0.031)	(0.040)	(0.038)	(0.044)	(0.038)	(0.047)
Southern Region	-0.069	0.046	-0.070**	0.022	-0.027	0.005	-0.025	-0.029
	(0.030)	(0.040)	(0.030)	(0.041)	(0.038)	(0.044)	(0.038)	(0.046)
Constant	-0.112*	0.045	-0.117**	-0.025	-0.094	0.005	-0.090	-0.051
	(0.058)	(0.074)	(0.058)	(0.075)	(0.071)	(0.081)	(0.071)	(0.087)
Observations	1,490	1,490	1496	1496	1,084	1,084	1,089	1,089
R-squared	0.389		0.390	0.005	0.365	0.031	0.364	0.046
Wu-Hausman F-test		16.873		5.746		11.017		6.686
		p = 0.000		p = 0.017		p = 0.001		p = 0.001
First-Stage F-test		58.563		72.300		60.146		72.699
		p = 0.000		p = 0.000		p = 0.000		p = 0.000
Sargan Chi-2		1.906		2.111		0.001		0.022
Overidentification Test		p = 0.167		p = 0.146		p = 0.981		*p = 0.881*
Sample	Age 15-24, Had Sex, and Single or Divorce							
	Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1							

*Coefficients from household wealth and cohort dummy variables not shown and are available upon request. The household wealth coefficients are all insignificant, whereas coefficients for those aged 20-24 are generally significant at the 5% and 1% level.

In our second stage regression relating to HIV testing, we find promiscuous behavior to be negatively and significantly associated with the demand for HIV testing in our weak condom use measure. The negative association between risky sexual behavior and the demand for HIV testing has important implications as those who are most at risk of HIV seem least likely to test for HIV. R. L. Thornton (2008) also finds that those at risk of HIV infection are less likely to retrieve their HIV test results. Promiscuous behavior, however, becomes insignificant in our stronger measure for condom use, suggesting frequent condom use compensates for risky sexual behavior, or that risky behavior is mitigated by risk aversion through frequency of condom use. Our additional control variables are insignificant, and overall we find the coefficients of condom use to be consistent with the base model, suggesting robustness.

DISCUSSION

Using an instrumental variable model, we find frequency in condom use is associated with a lower likelihood of HIV testing, whereas in a single equation model we find the opposite. Given that condom use is an endogenous variable, the single equation measure is subject to bias. Hence, it must be the case that more frequent condom use decreases an individual's perceived likelihood of infection. A lower prior belief of HIV infection is found to be associated with a lower likelihood of HIV testing (Morin et al. 2006; Wilson 2016).

Assuming that the availability of antiretroviral therapy encourages HIV testing, we expect a general increase in the demand for testing. This increase in the demand for HIV testing comes with a cost for the providers as HIV testing and treatments are for the most part free to clients in Africa. Our result is then important for the long-term outlook of HIV prevention cost in Africa if consistency in condom use decreases the demand for testing. Improvements in technology have reduced the cost of HIV testing, counseling and antiretroviral therapy (Fasawe et al. 2013; WHO 2013). However, these policies are still significantly more expensive than increasing condom availability (Creese et al. 2002; Hogan et al. 2005; R. L. Thornton 2005). For example, R. L. Thornton (2005) finds cost effectiveness in HIV prevention is driven by condom use. The increase in condom use, however, depends on accessibility, stigma on condom users, branding of condoms, social marketing, and cultural factors (Tavory and Swidler 2009). As beneficial as condoms are, users should be aware that condoms are most effective if used consistently. Condoms also have on average a 10 percent failure rate (Hearst and Chen 2004).

Overall, we suggest that although increasing the availability of HIV testing, counseling, and antiretroviral therapy are very important in reducing new HIV infections, increasing the availability of condoms, condom education, and destigmatizing condom use are equally important. This is because condom use is a first line of defense against HIV infections for the sexually active. Our results indicate if individuals can be encouraged to use condoms regularly, the possibility exists that the cost to governments and NGOs of providing HIV testing, counseling, and antiretroviral therapy can be reduced.

CONCLUSION

HIV testing may be potentially beneficial in curtailing the HIV epidemic in sub-Saharan Africa. Yet, a majority of infected individuals have never tested. Our results indicate that condom use is overall complementary to HIV testing. When we measure condom use as a signal of the degree of risk aversion, we find frequency of condom use partially compensates for the demand for HIV testing. Hence, although condom use, in general, is a complementary good to HIV testing, the degree of complementarity depends on frequency of use. Implications of our results can be important for the cost effectiveness in HIV prevention in sub-Saharan Africa. Most sub-Saharan African countries are low-income countries, and providing subsidized antiretroviral therapy and testing centers can divert resources from other necessary sectors of their economies. Encouraging frequent condom use may be a cost-effective method of curtailing the HIV epidemic.

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ENDNOTES

1. If a person would not take antiretroviral therapy, we presume he would not need to take the test. Hence, we assume they take antiretroviral therapy if HIV positive.

2. Although we could have chosen a nonlinear model for our estimation method such as a probit model, we prefer the Linear Probability Model (LPM) for its simplicity and because recent research has shown LPM results are similar to probit results.

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Determinants of Credit Union Net-Worth Change during the Financial Crisis

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ABSTRACT

Changes in credit union net-worth ratios were examined during the 2008-09 Financial Crisis. Except for three indicator variables, all explanatory variable coeffiencts had their hypothesized signs and were significant at the one percent level. Since loan rates fell much less than investment rates, credit unions with higher loans/asset ratios experienced smaller net-worth ratio decreases. Loan yield indicated a positive association while cost-of-funds and operating expense ratios indicated a negative association with net-worth ratio change. As fee revenue has become increasingly important for credit union operations, it was no surprise that fee/asset ratios were positively associated with net-worth ratio change. In addition, credit union size was positively associated while change in size, charge-offs and real estate loans/asset ratios were negatively associated with net-worth ratio change.

INTRODUCTION

Credit union growth as a performance variable has been examined in a number of past studies, including Ward and McKillop (2005), Goddard and Wilson (2005), Goddard, McKillop and Wilson (2008) and Tokle and Tokle (2010). Also, Hoel and Kelly (1999) defined "thriving" small credit unions as those with above average growth rates.

However, during the 2008-09 Financial Crisis, the financial health of banks and credit unions became a concern in the financial industry and more attention turned to a depository institution's capital ratio. Yu (2000, p. 109) wrote that "government regulatory bodies often use some requirement on capital adequacy as the criteria to judge whether a bank meets the standards of sound financial health." The net-worth ratio is essentially a measure of the capital-to-asset ratio for credit unions. We use these terms interchangeably in this paper. Everything else equal, credit unions with higher net-worth ratios could withstand higher credit risk and higher loan charge-offs and yet remain solvent and continue to make loans during the financial downturn.

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Ironically, as late as 2007, many in the credit union industry felt that credit union net-worth ratios were too high. They argued that maintaining high net-worth ratios can impede credit union growth, and that better use of their capital could go to offer better rates and service and/or lower fees. For a summary of these arguments, see Tokle and Tokle (2008, p. 86). In addition, Jackson (2007) made an analysis of the net-worth ratios for credit unions and concluded that "this strongly suggests that the U.S. credit union industry is currently overcapitalized by an amount in the 30-40% range" (p.36).

Table 1 shows credit union failures, the number of credit unions, and the failure rates for the years 2005-2012. While credit union failures still occurred when the economy was strong, such as during 2005 and 2006, this rate essentially doubled in the 2008-10 period. Also note that the number of credit unions has been decreasing since it peaked at 23,866 in 1969 (Credit Union National Association, 2012b). This rate of decrease has been fairly constant during the 2005-2012 period. Notably, the vast majority of this decrease in the number of credit unions has been due to mergers rather than liquidation. Many or most troubled credit unions merge with a healthy credit union, called a "purchase and assumption." Smaller credit unions have been also merging into larger credit unions due to a lack of economies of scale.

The National Credit Union Administration (NCUA) has created categories of net-worth ratios to rate a credit union's financial health. For example, in the time period of the 2008-09 Financial Crisis, a credit union with a net-worth ratio from 4.0 percent to 5.99 percent was considered as being "undercapitalized" and among other requirements, it would have to prepare and submit a "net-worth restoration plan." The probability of liquidation or merging increases as a credit union's net-worth ratio gets closer to zero.

Table 1. Credit Union Failures during 2005-2012

Year	# of Credit Union Failures	# of Credit Unions	Failure Rate (%)
2005	16	9,011	0.178
2006	19	8,662	0.219
2007	13	8,267	0.157
2008	22	8,088	0.272
2009	28	7,831	0.358
2010	37	7,728	0.479
2011	16	7,351	0.218
2012	21	7,165	0.293

Source: Credit Union National Association Economics and Statistics Department.

According to the Credit Union National Association (2010, p 2), "the financial crisis that began late in 2007 led to a substantial drop in the average credit union capital ratio." With the U.S. economy facing the worst recession since the Great Depression, credit union regulators and the industry started to focus more on net-worth ratios. During 2009, most of the corporate credit unions (which provide financial services for credit unions) operated with too little net worth and needed to be bailed out by the credit union industry via a program ran by the U.S. Treasury. Meanwhile, many retail credit unions struggled to maintain their net-worth ratios and worried about survival. This paper examines explanatory variables associated with change in credit union net-worth ratio during the peak of the 2008-09 Financial Crisis.

LITERATURE REVIEW

We found only one study in the literature that examined the determinants of credit union net-worth ratios. A little more has been written on the determinants of bank capital ratios. However, Ahmad et al. (2009) investigated determinants of bank capital ratios and wrote that although their "study focuses only on one developing country, these findings may help to identify the correlates of bank capital ratios in both developed and developing economies since this topic received scant attention of researchers" (page 255).

Shrieves and Dahl (1992) examined the effects that risk change may have on bank capital ratio change and vice versa, using a simultaneous model. They found that risk change, measured by the mix of asset risk in a bank's portfolio, had a positive effect on capital ratio change, while bank size did not. Yu (2000) found that for banks in Taiwan, liquidity and profitably were positively related to capital ratios, while bank size was negatively related. Brewer et al. (2008) examined why bank capital ratio changes are influenced by bank specific factors and country specific factors. Among the bank specific determinants, bank capital ratio changes was positively associated with asset risk and negatively associated with bank size, while the real gross domestic product and return-on-assets coefficients were insignificant.

Ahmad et al. (2009) investigated determinants of bank capital ratios for banks in Malaysia for an eight year period spanning the 1997-1998 Asian Financial Crisis. For their study, the explanatory variables risk, net-interest margins and size had negative associations with capital ratios, while non-performing loans had a positive association. The results of the risk and net-interest margins were inconsistent with past findings. Francis and Osborne (2010) examined factors of bank risk-based capital ratios in the United Kingdom. They confirmed that capital requirements are strongly related to capital ratios. Among other factors, provision for loan loss was found to have a positive effect on capital ratios, while return-on-equity, asset risk, bank size and GDP growth all have negative effects.

Frame et al. (2002) was the only paper we found that examined determinants of credit union capital ratios. Their paper analyzed how credit union risk differs by credit union membership type. The membership types were occupational (both single and multi-bond), associational and residential. In one of their regression models, capital ratio was the dependent variable since "capital ratios may be used as a proxy for the underlying risk profile of the credit union" (p.619). Their results showed that credit union size had a negative effect on capital ratios, while being a federally chartered credit union (subject to more regulatory scrutiny) had a positive effect. Associational and residential credit unions had lower capital ratios. And for loan type, real estate and unsecured lending had a positive effect on capital ratios, while auto lending had a negative effect.

In sum, there have been few studies that investigated the determinants of bank or credit union capital ratios. Some examined bank capital, in four different countries, and just one study investigated credit union net worth, going back to 2002. Overall, the most consistent finding was that capital ratios were negatively associated with asset size.

This paper, which examines determinants of credit union net worth change during 2009, adds to the literature in two ways. First, it is the first paper that we know of that focuses solely on determinants of credit union net-worth ratio change. As Ahmad et al. (2009) pointed out, even for banks, papers examining the determinants of capital ratios have received "scant" attention. Second, this paper examines credit union net-worth change during the 2008-09 Financial Crisis. As the financial crisis developed during 2009, participants in the economy, including credit unions, did not know how severe economic conditions would get and when the downturn would end. Hence, trying to maintain net-worth ratios and prevent their falling became increasingly an important focus in the credit union industry as many credit unions worried about survival.

MODEL

This model examines which explanatory variables had an impact on the change in credit union net-worth ratios during the 2008-09 Financial Crisis. While net-worth change during 2008-2010 was also run as a dependent variable, we report only the results of the year-end 2008 to year-end 2009 model since this time period was at the height of the financial crisis. In addition, these results were somewhat more robust, while both time periods yielded similar results

Dependent Variable: The net-worth ratio change (ΔNetW) between 2008 and 2009 was calculated as net-worth ratio year-end 2009 minus net-worth ratio year-end 2008, measured as a percent. When the net-worth ratio change is positive the net-worth ratio is higher in 2009 than in 2008, and vice versa.

INDEPENDENT VARIABLES

1) Total Loans/Assets (Loans/Assets), measured in percent. In response to the 2008-09 Financial Crisis, the Federal Reserve Bank pursued by historical standards an extremely stimulative monetary policy that quickly lowered short-term interest rates to near zero. Since most investments made by credit unions are also short-term in nature, the rates on these investments also suddenly decreased to near zero. Meanwhile credit union interest rates on loans, although decreasing to recent historic lows, were still significantly above zero. For an example, Table 2 compares the decrease in average used-vehicle rates for credit unions with the corresponding decrease in the 1-year Treasury rate. Note that the difference between these two rates increased by nearly three times, or from 2.1 percent in 2006 to 5.7 percent in 2009. In addition, Keeley (1990) tested for the effects of loans-to-assets on capital ratios for large bank holding companies in one of his regression models. Its coefficient was positive, but not significant. We expect that credit unions with a higher loans/assets ratio will have, ceteris paribus, higher net income (and a higher return-on-assets), and consequently have a positive effect on net-worth ratio change.

Table 2. Credit Union Used-Vehicle Rates and 1-Year Treasury Rates

Year-End	Used-Vehicle Rate	1-Year Treasury
2006	7.0%	4.9%
2007	7.0%	3.3%
2008	6.4%	0.5%
2009	6.1%	0.4%
2010	5.4%	0.3%
2011	4.6%	0.1%

Source: Credit Union National Association, *Credit Union Report, Mid-Year 2012*.

2) Yield on Average Loans (LoanYield), measured in percent. Although loan rates in the economy generally move up and down together, rates can vary between credit unions in a local market and also between local markets as some local markets experience more competition among depository institutions. We expect that credit unions with higher loan yields will have higher net income and a positive change in the net-worth ratio.

3) Cost-of-Funds/Average Assets (Cost-of-Funds), measured in percent. Likewise, cost-of-funds can vary between credit unions in a local market and also between local markets. In reasoning similar to loan yield, we hypothesize that credit unions with higher cost-of-funds will have lower net income and hence the effect on net-worth ratio change will be negative.

4) Operating Expenses/Average Assets (Expen/Assets), measured in percent. Credit unions with higher operating expenses, similarly to cost-of-funds, should have lower net income. Hence, we expect Expenses/Assets to have a negative effect on the net-worth ratio change.

5) Fee Revenue/Total Assets (Fees/Assets), measured in percent. Fee income has become increasingly an important source of revenue for credit unions. For example, average credit unions spreads in 1991 showed that while return-on-average assets was 0.94 basis points, only 0.42 came from fee income. However, by 2009, return-on-average assets were only 0.15 (due to the financial crisis) while fee income was 0.82 (Credit Union National Association, 2012a). We hypothesize those credit unions with a higher fee income to have higher net incomes, and consequently Fees/Assets will have a positive effect on net-worth ratio change.

6) Credit Union Size (Size). As is commonly done because of skewness, size is measured as the logarithm of a credit union's total assets. Both bank and credit union size have often been used as a proxy variable for economies-of-scale [Barret and Unger (1991), Hannan and Liang, (1995), Wilcox (2006) and Wheellock and Wilson (2011)]. Greater credit union size leading to greater economies-of-scale could lead to higher net income and hence is hypothesized to have a positive effect on the net-worth ratio change.

7) Credit Union Size Change (∆Change), measured in percent**.** During a financial crisis, banks (and other depository institutions) often "reduce the bank's assets by making fewer loans or by selling off securities and then using the proceeds to reduce its liabilities" (Mishkin, 2013, p. 228) to strengthen their capital ratios. We expected that a decrease in credit union size could have been a strategy for some credit unions to strengthen their net-worth ratios during the time period of the financial crisis. We expect that change in size will have a negative effect on net-worth ratio change.

8) Net Charge-Offs/Average Loans (Charge-Offs), measured in percent. Higher charge-offs could cause a credit union to tighten its lending standards and make fewer loans, resulting in more assets in investments earning near-zero interest rates. Of course, higher charge-offs will also increase a credit union's provision for loan loss, decrease net income, and negatively affect the net-worth ratio. For both reasons, we expect higher charge-offs to lead to a lower net-worth ratio.

9) Real Estate Loans/Total Loans (RE/Loans), measured in percent. Many financial institutions were weakened during the financial crisis by real estate loans on their balance sheets. A credit union's provision for loan loss typically is calculated by multiplying a rolling 12-month average loan loss by current loan balances to derive the anticipated loan loss by each loan category. Hence, credit unions with a higher percent of assets in real estate loans would see their anticipated loan loss increase, which would in turn increase their provision for loan loss and consequently decrease net income. Thus, we hypothesize that real estate loans had a negative effect on net-worth ratio change during 2009.

10) Indirect Loans (IndirLoans), an indicator variable = 1 if indirect loans are offered; 0 = otherwise. Credit unions with indirect vehicle lending programs lend indirectly to their members through a dealership for a fee, paid by the credit union. These loans tend to be more risky, especially during the financial crisis. In a similar fashion to real estate loans, we would expect that credit unions that engage in indirect lending could experience an increase in their anticipated loan loss and hence a decrease in net income. On the other hand, indirect lending may increase net income for credit unions. Here are two reasons why. First, credit unions with indirect lending tend to have higher loan/asset ratios, resulting in higher revenues. Second, according to Staten et al. (1990), indirect lending may reduce costs. They wrote that "the theory implies that commercial banks use indirect lending for consumer durables to reduce the costs of lending across risk categories" (p.527). Hence, since the impact of indirect loans is ambiguous, it will be a 2-tailed test.

11) Risk-Based Lending (RBLending), an indicator variable = 1 if the credit union has adopted risk-based lending; 0 = otherwise. Credit unions that have adopted risk-based lending use a borrower's credit scores as a proxy measure for "credit risk." Borrowers with high credit scores receive loans with lower interest rates, while those with lower credit scores pay higher rates to cover the increased likelihood of collection costs and loan charge-offs associated with their higher credit risk.

Risk-based lending may increase loan volume for a couple of reasons. First, more loans may be made to members with good credit scores who may otherwise look elsewhere for loans with lower rates.

Second, more loans may be made to members with lower credit scores at higher rates. Credit unions that charge one rate to all borrowers may feel that it is necessary to turn down loans to higher-risk members due to the anticipated higher costs (Tokle, Picard and Tokle, 2003). Hence, risk-based lending may mean a higher percentage of assets in loans, resulting in higher net income, leading to an increase in net-worth ratio.

12) Federal Charter (FedCharter), an indicator variable**=** 1 if the credit union has a federal charter; 0 = otherwise. Frame et al. (2002) found that federally chartered credit unions (subject to more regulatory scrutiny) had a positive effect on capital ratios. Likewise, we expect federal charters for credit unions to be positively associated with net-worth ratio change.

The model used in this study is expressed in Equation 1:

$$\Delta\text{NetW} = a_o + a_1\,\text{Loans/Assets} + a_2\,\text{LoanYield} + a_3\text{Cost-of-Funds} + a_4\,\text{Expen/Assets} + a_5\,\text{Fees /Assets} + a_6\,\text{Size} + a_7\,\Delta\text{Size} + a_8\text{Charge-Offs} + a_9\text{RE/Loans} + a_{10}\text{IndirLoans} + a_{11}\text{RBLending} + a_{12}\text{FedCharter} \quad (1)$$

SAMPLE

The population consisted of all credit unions in the U.S. beginning in 2009, less three exceptions. First, all credit unions that either failed and closed or were involved in a merger were excluded during the examination period since they either ceased to exist or their financials changed due to merging with another credit union. Second, all credit unions with assets less than $10 million were also excluded. During 2009, the National Credit Union Administration (NCUA) had defined small credit unions as those with total assets less than $10 million (Chilingerian, 2015). NCUA increased this definition to $100 million in 2015. While the NCUA designates these thresholds for regulatory relief, we eliminated credit unions under $10 million because they also tend to be less complex and offer fewer products and services in comparison to other credit unions. Thus, their reaction to the financial crisis could be somewhat different relative to other credit unions. Finally, all credit unions that had total assets at the end of 2008 over $6 billion were eliminated from the data set since they could also possibly cause skewness due to potential higher influence in the model. The final sample size after these adjustments was 4112.

Table 3 reports descriptive statistics for the defined variables of the credit unions in the final sample. Asset size is reported in millions of dollars, but is presented in natural logarithmic form in the regression model. All other variables are reported as percentages. As expected during a financial crisis, the average credit union net-worth ratio decreased by 1.38 percent during 2009, with a maximum increase of over 5 percent and a maximum decrease of nearly 11 percent. The credit unions in the sample held about 59 percent of their assets in loans, with ranges from zero (all of their income-earning assets in investments) to 98 percent. The average loan yield was 6.82 per cent, while the average cost-of-funds was 1.43 percent. The average operating expense ratio was 3.84 percent, while fee revenue averaged

0.87 percent of total assets, with a maximum of over 6 percent, and a minimum of zero (no fees). The average credit union size was $144 million, with the average change in credit union size being over 9 percent. Average net charge-offs/average loans was 0.88 percent, while about 41 percent of credit union total loans were in real estate. Lastly, 38 percent of the credit unions in the sample participated in indirect lending, while 68 percent participated in risk-based lending, and 59 percent had federal charters.

Table 3. Descriptive Statistics of the Variables.

Variable*	Mean	Median	Maximum	Minimum	Std. Dev.
∆NetW	-1.38	-1.23	5.58	-10.77	1.19
Loans/Assets	59.03	60.51	98.00	0	16.06
LoanYield	6.82	6.68	15.96	3.92	0.98
Cost-of-Funds	1.43	1.41	4.93	0.11	0.47
Expen/Assets	3.84	3.79	11.51	0.10	1.27
Fees /Assets	0.87	0.74	6.26	0.00	0.69
Size	$144.2 M	$39.4 M	$5,947.6 M	$10.0 M	$372.3 M
∆Size	9.62	8.74	84.82	-29.42	9.71
Charge-Offs	0.88	0.64	9.31	-1.31	0.91
RE/Loans	41.07	41.73	98.15	0.00	22.42
IndirLoans	37.6				
RBLending	68.4				
FedCharter	58.9				

*All variables in percent except Size.

RESULTS

The regression results are reported in Table 4. Except for the three dummy variables, the parameter estimated coefficients for all of the explanatory variables had their hypothesized signs and were significant at the 1 percent level. The three dummy variables, for indirect lending, risk-based lending and federal charter, were not significant predictors of net-worth ratio change. The overall model produced a moderately strong R-squared value of 53 percent. In addition, all Variance Inflation Factors were below 5 indicating that multicollinearity was not a problem in this model. Finally, a residual analysis demonstrated approximate normality and homoscedasticity. Since the assumptions are met and we have a large sample size, this model can be considered reliable.

Credit unions with a larger percentage of their assets in loans were associated with a smaller decrease in net-worth ratio. This was expected. As Table 2 shows, interest rates on credit union loans were much higher than returns on investments during this time period due to monetary policy. However, the Loans/Assets coefficient was small. For every 1 percent increase in Loans/Assets, the net-worth ratio change is predicted to increase by 0.017 percent, controlling for the other explanatory variables in the model. Also as expected, a higher loan yield and a lower cost-of-funds are associated with a positive change in net-worth ratio.

Holding all other variables in the model constant, a higher operating expenses/assets ratio, which will lower net income, is associated with a significant negative effect on net-worth ratio change. Fee income has become an increasingly important source of credit union revenue in recent years, with fees/assets

ranging from zero to over 6 percent in the sample. The fees/assets has a relatively large coefficient of 0.547, which means that for every 1 percent increase in fees/assets, the net-worth ratio change is predicted to increase by 0.547 percent, controlling for the other explanatory variables. Fee revenue has clearly become an important component of credit union operations in recent years, and credit unions with higher fee income were more likely to maintain net worth during the financial crisis.

Consistent with the hypothesized effect of economies-of-scale on the net-worth ratio change, the credit union size coefficient was positive and significant. However, it should be noted that Shrieves and Dalh (1992) found bank size was not significant in their capital ratio change model, while Brewer et al. (2008) found that bank size was associated with a negative change in bank capital ratio. It appeared that banks grew larger with assets increasing more quickly than capital. In addition, as expected, the change in credit union size had a negative coefficient. Not surprisingly, this coefficient, while being relatively small, was very significant and had the largest t-statistic of nearly 58. This supports the idea that some credit unions worked to slow asset growth or even decrease asset size to strengthen their net-worth ratio positions during the financial crisis.

Since an important cause of the financial crisis and of the failure of financial institutions was failing real estate loans, it was not surprising that net charge-offs/average loans had the largest coefficient, as well as a t-statistic of nearly 43. For every 1 percent increase in charge-offs, the net-worth ratio change is predicted to decrease by 0.681 percent, controlling for the other explanatory variables. Lastly, credit unions with higher real estate loans/loans were associated with a small, but negative net-worth ratio change. As more mortgages failed during the financial crisis, a higher percent of a credit union's assets in real estate loans would increase anticipated real estate loan charge-offs and result in lower net income via a larger provision for loan loss.

Table 4. Dependent Variable: Change in Net-Worth Ratio 2008-2009

Variable	**Coefficient**	**t statistic**	**Significance**	**VIF**
Constant	- 3.423	-11.36	.000	
Loans/Assets	0.017	15.48	.000	1.820
LoanYield	0.304	16.34	.000	2.026
Cost-of-Funds	-0.203	-5.58	.000	1.840
Expen/Assets	-0.440	-21.59	.000	4.140
Fees /Assets	0.547	18.68	.000	2.5364
lnSize	0.113	7.78	.000	1.992
∆Size	-0.082	-57.82	.000	1.171
Charge-Offs	-0.681	-42.98	.000	1.291
RE/Loans	-0.003	-4.27	.000	1.6474
IndirLoans	-0.011	-0.68	.499	1.511
RBLending	0.007	0.48	.631	1.192
FedCharter	-0.012	-0.89	.373	1.023

R^2 = .53

CONCLUSION

As recently as 2007, many argued that credit union net-worth ratios were too high. But after the 2008 Financial Crisis, the health of financial institutions was emphasized. The net-worth ratio is one the most basic measures of a credit union's financial health. This paper examined which explanatory variables were related to the change in the credit union net-worth ratio during 2009, at the depth of the financial crisis.

Interest rates dropped to near zero for short-term, safe securities as uncertainty of credit risk in the economy caused a "flight to safety" and the Federal Reserve pursued a very easy monetary policy. As a result, interest rates decreased much more for credit union investments than for loans. As hypothesized, credit unions with more loans relative to investments experienced, all else equal, a smaller decrease in net-worth ratio. Some credit unions did focus on making loans as a way to maintain net worth. For a case study of a credit union using this strategy during 2009, see Tokle and Tokle (2012).

In addition, the positive coefficient for loan yield indicated a positive association with the change in net-worth ratio while the negative coefficients for both cost-of-funds and operating expense ratios indicated a negative association with change in net-worth ratio. Both credit union loan and deposit rates can vary between both local markets due to competition and among individual credit union pricing strategy within a local market.

As with banks, fee income has dramatically increased during recent years as an important source of revenue for credit unions. It was no surprise that credit unions with higher fee/asset ratios were associated with, ceteris paribus, a smaller decrease in net worth ratio. As expected, credit union size, a proxy measure of economies-of-scale, had a positive effect on change in net-worth ratio. On the other hand, the change in credit union size, as expected, had a negative effect on change in net-worth ratio. There exists anecdotal evidence that some credit unions and banks tried to slow asset growth or even tried to decrease asset size during the financial crisis to shore up their capital ratios. For a case study of a credit union using this strategy during 2009, see Tokle and Tokle (2012).

Lastly, it was not a surprise that loan charge-offs had the largest coefficient, indicating a large predictive negative effect of charge-offs on change in net-worth ratio. And since real estate charge-offs increased so dramatically during the financial crisis, credit unions that had a larger percentage of their assets in real estate experienced, all else equal, a decrease in net-worth ratio.

Further research may examine net-worth ratio change in different time periods for a comparison to that of the financial crisis, or how net-worth ratio change and its corresponding relationship with the explanatory variables varied between states whose economies did well during the financial crisis and the "Sand States" of Arizona, California, Florida and Nevada that experienced the largest increase in mortgage foreclosure rates during the run up to the financial crisis.

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Would You Put Your Money Where Your Carbon Is? Survey Evidence from Commuters to a College Campus

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ABSTRACT

We conduct a survey of commuters to a midsize public college campus to gauge their support of a program in which they could offset the carbon emissions associated with their commutes. We present each respondent with a dollar estimate of his/her climate damages over the academic year. We then ask whether the respondent would be willing to pay for these damages in the form of a higher parking fee, given that the funds collected above and beyond the normal parking fee would be used to offset their damages. Logit regressions shed light on the factors that are correlated with willingness-to-pay likelihood across constituent groups on campus. We also demonstrate how to extrapolate the survey results to the greater campus community in order to estimate the total emissions of commuters.

INTRODUCTION

The purpose of this paper is to explore a policy that we would like our college to implement as part of its sustainability program. We propose that purchasers of College parking stickers be offered the opportunity to make a voluntary additional payment to offset the damages of the carbon emissions caused by their trips to and from campus. The money raised by these payments would be used to finance green initiatives such as purchasing power from green sources. The notion of asking individuals to make voluntary contributions to cover the external costs of their actions is not unknown. For example, New York State Electric and Gas (NYSEG) offers its household customers the opportunity to pay an additional fee to purchase wind-generated power.[1]

Since pollution abatement is a public good, it is subject to the free-rider problem. It would be naïve to expect that voluntary contributions would cover all of the costs caused by the carbon emitted by commuters to and from campus. However, not all individuals in the position to ride free do so. For example, National Public Radio (NPR) is supported in large part by voluntary contributions from its listeners. Our proposal would offer faculty, staff and students who believe that climate change is a pressing social problem a tangible way in which to be part of the solution. Otherwise put, we want to offer commuters the opportunity to "put their money where their carbon is."

Implementing our proposal would place an administrative burden on the personnel in the Parking and Traffic Office. Therefore, it is reasonable to ask whether enough parking sticker purchasers would be willing

to participate to make the policy worthwhile. To answer this question, we asked the entire campus community to complete a questionnaire. In the questionnaire, we asked commuters to provide the type of vehicle they drive, the length of their commutes and the number of trips they make to and from campus each week. The survey instrument then provided an estimate of the external costs caused by the respondent's carbon emissions, and asked whether the respondent would be willing to make a voluntary payment to cover this amount.

The data collected by this exercise also serve a second purpose. We can extrapolate our survey results to estimate the total carbon emitted by commuters to campus. Colleges that are signatories to the high-profile American College and University President's Climate Commitment (PCC) are required to report their carbon emissions in Scope 3 of their greenhouse gas inventories.[2] However, an examination of the emissions data provided by the schools by Sirianni and O'Hara (2014) indicates that many colleges have great difficulty in estimating this particular category of emissions. Many institutions enter a "ballpark" figure, and then use that same figure year after year, while other institutions simply leave the category blank altogether. As a result of the inconsistent way that emissions from commuters are reported, the entire category of Scope 3 emissions is rendered unusable to researchers. We argue that the survey presented here is a useful tool for assessing not only whether our constituents are willing to offset their emissions from commuting, but also for conducting accurate greenhouse gas inventories to fulfill the requirements of the PCC and other voluntary commitments.[3]

However, there is an ongoing debate in the stated preferences/contingent valuation literature about the usefulness of the data collected by surveys for policy purposes. Hausman (2012, p. 43) argues that respondents to "surveys are often not responding out of stable or well-defined preferences, but are essentially inventing their answers on the fly in a way that makes the resulting data useless for policy analysis." It is reasonable to wonder whether people would behave in the same way when they are spending real rather than hypothetical dollars. Carson (2012) would counter that when data based on observed behavior are unavailable, information generated by surveys might provide a practical alternative. Nevertheless, one needs to be aware of this and other biases (such as sampling and endogeneity bias) that may affect the reliability of the estimates.

Our paper will then proceed as follows. The next section will provide a non-exhaustive consideration of the stated preference/contingent valuation literature. Carson and Hausman are on opposite sides of a

debate that has been going on for two decades with no end in sight. We do not propose to settle this debate. However, the literature does provide useful guidelines that guide the design of our questionnaire. We then provide a more detailed look at how our survey was designed and implemented. In the penultimate section, we present and discuss our findings, in which we use binary response (logit) models to evaluate the factors that correlate with a willingness to contribute. The purpose is to determine whether willingness to contribute depends in a reasonable way on factors such as income and beliefs about the importance of climate change. The paper concludes with a policy recommendation and suggestions for future research.

RELATED LITERATURE

A key message from the stated preference literature is that survey design is crucial. Kling, Phaneuf and Zhao (2012) provide guidelines for good survey design (what they term "content validity"). These guidelines, which are based on the work of the National Oceanic and Atmospheric Administration (NOAA) Panel on Contingent Valuation (Arrow et al., (1993)) strike us as reasonable. The survey should describe the environmental good to respondents in a way that is faithful to the underlying science and understandable to a lay participant. Likewise, the policy intervention should be clearly described. Respondents should know how much they will be expected to pay if the policy is implemented and whether the payment will be coercive or voluntary. The mechanism for collecting the payment has to be realistic. In short, to paraphrase Carson (2012), respondents need to be provided with enough information to make an informed decision.

To be avoided are open-ended questions that a layperson would find difficult to answer. For example, Hanemann (1994) and Schkade et al. (1993) would argue that asking respondents how much they would be willing to save the rainforest is unlikely to yield useful results. Hanemann (1994, p. 22) puts it this way: "Paying for wilderness is meaningless; what is meaningful is paying higher taxes or prices to finance particular actions." In the context of our paper, asking respondents how much they would be willing to pay to cover the cost of the carbon emitted during their trips to and from campus would be a mistake. It is unlikely that the typical person completing the survey would have any idea how to approach this problem let alone be able to arrive at a plausible value. To avoid this problem, based on information provided by survey participants, we provide each participant with an estimate of his/her carbon damages and ask whether the participant would be willing pay this amount. A final consideration raised by Hausman (2012)

is that participants have limited time (and probably limited patience) to devote to completing surveys. On our campus “survey fatigue” is an oft-noted problem. Therefore, we tried to make sure that the demand of our survey on the participants was modest. Additionally, we obtained a grant to offer prizes for completing the survey so as to reduce sample selection bias.

Ideally, Kling et al. (2102) suggest that the survey instrument be pre-tested to make sure that the situation presented to participants is clear. They note that “vague and abstract descriptions” can lead to unreliable responses (pp. 8-9). In this same vein, Hausman (2012) points out that with poorly designed questionnaires, minor wording changes can lead to major changes in the responses. We presented the initial version of our survey instrument to the students and faculty participating in the Senior Seminar in Economics. Based on the feedback we received, we made some minor changes in the wording of the questions. To gauge the effects of any possible misunderstandings in the survey, we asked respondents to provide comments at the end. This “pseudo-debriefing” section is discussed in the concluding remarks to this paper. At this point, we can report that most respondents found the survey to be clear and straightforward to complete.

Even if the survey is well-designed, this does not mean that it will yield accurate information. Since by their nature surveys deal with situations that the respondents have not directly experienced, they are subject to hypothetical bias. Hausman argues that this bias leads to overestimates of the respondents’ willingness-to-pay. Strategic behavior on the part of respondents could also bias willingness-to-pay estimates. For example, Kling et al. (2012) think that free-riders might overstate their willingness-to-pay for public goods. The expected payoff would be a larger level of public good provision and thus a larger payoff to free riding. Of course, a plausible argument could be that strategic behavior might lead to underestimates of willingness-to-pay. Following Samuelson's (1954) reasoning, if respondents anticipate that the survey results could result in a higher tax burden, then they would have an incentive to understate their willingness-to-pay.

In our case, we are not interested in estimating respondents’ willingness to pay per se but rather their willingness to make a voluntary contribution equal to the value of the external costs of their commuting emissions. Otherwise put, we are interested in estimating the participation level in our policy initiative. Nevertheless, some discussion on the potential for endogeneity bias is warranted, particularly since we use

regression analysis to examine the factors correlated with willingness to participate. If our aim was to actually identify the demand for carbon emissions reductions, it would be ideal to use exogenous bids, and perhaps adjust them within the survey to account for other effects such as anchoring (Arana and Leon (2007)). In our survey, the bids presented to respondents are based on the individual's own carbon damages from their commute. These damages are a function of factors that one could argue are exogenous, such as proximity to campus, but include other potentially endogenous factors, such as vehicle choice.

Research has aimed to correct for endogeneity in contingent valuation studies. In examining the willingness to pay for conservation improvements, Martinez-Espineira and Lyssenko (2011) find that when they account for endogeneity of membership in environmental organizations, those who belonged to such organizations were less likely to be willing to pay for the improvements offered in the survey. This result is contradictory to previous research that treated membership as exogenous. The authors suggest that the dues paid to organizations engaged in environmental causes are viewed as substitutes for other conservation efforts.

In our case, one might similarly argue that vehicles are chosen based on the environmental preferences of respondents. For example, someone may not be willing to participate in our initiative since they already purchased a small, fuel efficient vehicle, and this is the mechanism through which he/she contributes to environmental causes. However, there is evidence that vehicle choice (unlike membership in environmental organizations) is strongly affected by a number of exogenous factors, including gasoline prices (Jenn et al. (2013)) and government-sponsored rebate programs for hybrid vehicles (Chandra et al. (2010)).[4] These results suggest that endogeneity bias of this type would not be pervasive in our regressions. Furthermore, we believe this would only be of concern in the faculty/staff regressions, since there is an even greater chance that a student's vehicle type is exogenous (for instance, handed down by a family member, or purchased solely because of the price).

Carson and Groves (2007) argue that surveys of this type could also be subject to strategic behavior by participants. To illustrate, consider an NPR station that is considering mounting a fundraising campaign to pay for better programming. Prior to mounting an expensive campaign, the station might survey households in its listening area to determine how many families might be willing to contribute. In this case, some free-riders might indicate that they would be willing to contribute. Their hope would be that the

fundraising campaign would take place and raise enough money to pay for better programming, which they could enjoy at no cost. In our case, we see little incentive for this type of strategic behavior. The impact of a program at one small campus on the rate of increase of the mean global temperature is essentially zero. It could thus be reasoned that we are effectively capturing "warm glow", which Hanemann (1994) argues is a valid economic preference. Any mental effort devoted to analyzing the potential from free-riding in our policy would be futile.

Other researchers have used contingent valuation methods to estimate the willingness-to-pay for carbon. Brouwer et al. (2008) estimate air travelers' willingness-to-pay for carbon emissions and find significant differences in willingness-to-pay across regions of the world. Nomura and Akai (2004) find that the median willingness-to-pay for green power in Japan is around $17 per month, per household. While we make clear in the sections below that we are not trying to estimate willingness-to-pay for carbon, our survey approach is similar in that we adhere to as many of the survey design principles as are feasible.

SURVEY DESIGN AND IMPLEMENTATION

A total of 765 individuals responded to our questionnaire. Of these, 320 usable responses (commuters who provided a complete set of data) remained. This amounts to a response rate of around 9 percent.[5] Our College's Office of Institutional Research reports that the response rate to student surveys is typically in the 14-20 percent range, with a high of 60 percent and a low of 5 percent. The response rate is sensitive to the time of year (the later in the academic year, the lower), the size of the population surveyed (the smaller, the better), and whether there is a reward for participating. The union (United University Professions) and College Senate report a typical response rate for student surveys in the 12-17 percent range, with a high of 26 percent and a low of 9 percent. For faculty surveys, response rates are typically in the 36-47 percent range.[6] Here it should be noted that this response rate is heavily influenced by the Union's "Quality of Life Survey", which asks the faculty how they feel about issues such as salary and research support, and gives them the opportunity to rate the performance of the President and the other high-level administrators at the College. Our survey is not likely to generate this level of interest. Sampling theory would indicate that the response rate is not the key issue but rather the size of the sample. As long as the sample is randomly generated, it does not have to be large to represent the population reasonably accurately. Although we

cannot claim that our sample is random, we provide evidence below that its demographic makeup reflects that of the overall campus community across several dimensions.

In this section we describe the design of the survey and summarize the responses provided by these 320 commuters in Table 1. Note that this table summarizes the questions that were asked, the menu of responses that could be chosen, and the data used in our analysis.

Preamble

We begin the survey by giving each participant an introductory paragraph detailing what the survey is for, what the respondent will be asked, how long it will take, and reassuring the participant that all of their responses will remain confidential.

> *SUNY Oneonta is focusing now more than ever on campus sustainability, and we are taking some important first steps toward decreasing and offsetting our overall carbon footprint. We kindly ask for your participation in this short survey (estimated time: 5 minutes), the purpose of which is to gather information on the total amount of carbon emissions associated with the commutes to campus of students, faculty, and staff. In the survey, the carbon emissions associated with your commute will be estimated, and you will then be asked whether you would make a voluntary contribution in addition to the normal parking fee to offset the environmental damages due to your commute. Proposals offered for consideration by the campus community are to use the additional funds collected to increase the amount of electricity that is supplied to the College from green power sources (such as wind, solar, and hydropower), and/or to purchase carbon offsets. Please take a few minutes to complete this survey, and let's see where we stand on this issue! Let your voice be heard!*

The preamble has two key elements. First, we describe the purpose of the survey, which is to gather information about the respondent's carbon emissions associated with commuting to campus. Second, we state what we will ultimately ask of them – whether they would make a voluntary contribution in addition to their normal parking fee – and explain with two real, tangible examples how their contributions will be used means to offset the environmental impact of their carbon emissions. In other words, the preamble

Table 1. Summary Statistics for Commuters (N=320).

VARIABLES	(1) Mean	(2) SD	(3) Min	(4) Max
PLEASE SELECT YOUR GENDER.				
Male	0.341	0.475	0	1
Female	0.634	0.482	0	1
Decline to answer	0.025	0.156	0	1

*WHAT IS YOUR AFFILIATION WITH THE COLLEGE?**				
Admin/Staff	0.256	0.437	0	1
Faculty	0.313	0.464	0	1
Student	0.431	0.496	0	1
School of Arts & Hum.	0.078	0.269	0	1
School of Social Sci.	0.244	0.430	0	1
School of Econ & Bus.	0.150	0.358	0	1
School of Educ.	0.113	0.316	0	1
School of Natural Sci.	0.100	0.300	0	1
Other office	0.316	0.465	0	1
WHAT IS YOUR ANNUAL HOUSEHOLD INCOME?				
$0-$8,925	0.130	0.337	0	1
$8,926-$36,250	0.099	0.299	0	1
$36,251-$87,850	0.342	0.475	0	1
$87,851-$183,250	0.243	0.430	0	1
$183,251-$398,250	0.032	0.175	0	1
Decline to answer	0.155	0.362	0	1
DO YOU BELIEVE THAT CLIMATE CHANGE IS AN IMPORTANT ISSUE THAT SHOULD BE ADDRESSED?				
Important issue	0.859	0.348	0	1
Unimportant issue	0.041	0.198	0	1
Unsure of importance	0.100	0.300	0	1
HOW DO YOU COMMUTE TO CAMPUS?				
Heavy truck	0.009	0.097	0	1
Light truck	0.025	0.156	0	1
Van/SUV	0.178	0.383	0	1
Large car	0.078	0.269	0	1
Midsize car	0.294	0.456	0	1
Small car	0.416	0.494	0	1
*WILLING TO PAY FOR DAMAGES FROM COMMUTING***				
Yes	0.398	0.490	0	1
No	0.602	0.490	0	1
TOWARD WHAT END OF THE POLITICAL SPECTRUM DO YOU CONSIDER YOURSELF?				
Conservative	0.046	0.211	0	1
Somewhat conserv.	0.116	0.321	0	1
Independent	0.215	0.412	0	1
Somewhat liberal	0.202	0.402	0	1
Liberal	0.265	0.442	0	1
Decline to answer	0.156	0.363	0	1
COMMUTE DATA				
Ave. # of trips/day	2.281	0.828	2	10
Miles/trip	11.61	17.09	0.5	105
Gallons of gas/yr***	260.7	405.1	8.571	3,877
Emiss/yr (mt CO_2e)***	2.09	3.25	0.070	31.09
Damages/yr ($)***	52.14	81.01	1.714	775.4

*Students are instructed to select their primary major from a drop-down menu, which we then match with the School in which the major is housed. Administration/staff members not affiliated with any particular School are instructed to select Other Office.

**As detailed in the body of the paper, respondents are presented with an estimate of their climate damages based on the commute data entered. See Section III for more details on the specific wording and presentation of this question.
***These variables are calculated using the average MPG for vehicle type and model year (which we also ask respondents to enter but do not present here) and equations (1)-(3). Only the commuting damages are presented to the respondents.

tells participants what we are asking them to do, how the money will be used, and how the money will be collected. We do not believe there is anything abstract about the scenario we are asking the participants to consider, which is a key element of a well-designed survey as reviewed in the literature above.

Commute Data

At the heart of our survey are the questions dealing with the respondents' commutes to and from campus. Because our population of interest is student, faculty, and staff *commuters*, we exclude from the analysis those respondents who do not fall into this category. This would obviously include those individuals who did not purchase a parking pass, but also those who purchased a parking pass but live on campus. What remained were the 320 "usable" responses noted above. All summary statistics and analyses presented below use only these observations, since *commuters* are our population of interest for the Scope 3 emissions category.

Questions concerning the respondent's vehicle type, number of miles to campus, and number of trips made on average are used to calculate the total amount of carbon emissions over the academic year along with a dollar estimate of their climate impacts. Of course, different categories of commuters will travel to campus with different frequencies over the course of an academic year.[7] For instance, administrators may have very different schedules than faculty and students. These differences are taken into account in our survey. Nevertheless, we do require that each constituent group is able to provide some basic information about their cars and their commutes. We did not ask about specific vehicles models. Instead, we asked first what the year of their vehicle was and then what type of vehicle they drive. Respondents were provided with several examples for each vehicle type.

The distribution of vehicle type is displayed in Table 1. We then matched the vehicle type with the vehicle year and used data from the Environmental Protection Agency's (EPA's) fuel economy web page to determine the average fuel economy for that particular combination.[8] The combined city-highway fuel economy values used to calculate the respondents' climate damages are available from the authors upon request.[9]

Table 1 also shows summary statistics for respondents' commutes. On average, commuters make 2.3 trips to and from campus per day, and travel 11.6 miles one way.

Willingness to Pay for Climate Damages

The computation inputs for climate damages are the type of car and the number/length of the trips to campus. The accuracy of the output depends on the accuracy of the input. Assuming that people know what type of car they drive is straightforward. Since commuting is a repetitive activity, it is reasonable to assume that people know how many trips they take to campus by car in the typical week and the length of the trip. While the details of the computation are hidden, the respondents can see that the estimated damages depend on the type of car they drive and how many commuting miles they make per week. Even respondents who may not be able to comfortably think in terms of equations can see the logic of the connection. In the "comments" section at the end of the survey, the vast majority of respondents indicated that the questions and purpose of the survey were easy to understand.

We first use the commute data provided by respondents to calculate academic-year estimates of (1) the number of gallons of gasoline consumed, (2) the total amount of carbon emitted, and (3) a dollar value for their climate damages.

$$Gallons = (Miles/trip \times Trips/day \times Days/week \times 30\ weeks) / MPG \quad (1)$$

$$Emissions\ (MT\ CO_2e) = (17.68 \times Gallons) / 2204.6 \quad (2)$$

$$Damages = \$0.20 \times Gallons \quad (3)$$

Standard conversion factors are used in Equation (2) to determine the number of metric tons of CO_2-equivalent associated with the respondent's gasoline consumed from Equation (1). In Equation (3), we use a mid-range damage factor estimate of \$0.20 per gallon of gasoline consumed. This value assumes that the conversion factor is 0.00887 metric tons of CO_2e per gallon of gasoline, and that the social cost of carbon is \$22.60 per ton.[10]

Results are displayed in Table 1. Recall that these data apply only to trips to campus, and not to their overall driving throughout the academic year. On average, commuters use around 261 gallons of gasoline to commute, which is equivalent to 2.1 metric tons of CO_2e. The average climate impact estimate is $52.14. Clearly, there is a great deal of variation in the sample with regard to these estimates.

After entering the commute data described above, respondents are then presented with the dollar estimate of their own climate damages, and are asked the following question to which they choose "Yes" or "No":

> *Now that you know the environmental impact of your commute, would you be willing to pay $ [**respondent's damages**] on top of the normal parking fee? (Keep in mind that the funds collected would be used to offset our overall environmental impact from commuting, for instance by purchasing more of our electricity from green power sources and/or purchasing carbon offsets.)* [11]

Note that we remind the respondents that the funds collected will be used to offset their emissions. Forty percent of respondents stated that they were willing to pay their damage amount on top of the normal parking fee, while 60 percent were not. However, although 40 percent were willing to pay, this would only cover 20 percent of the total damages caused by respondents. The reason for this is that those with higher damages are, not surprisingly, less likely to be willing to entirely offset them. We explore this further in Section IV.

Demographics and Personal Opinions/Attitudes

This set of questions on the survey serve to collect demographic information. The information is used later in the logit models to analyze the factors correlating with being willing to pay to offset climate damages from commuting.

Table 1 displays the distribution of gender, income, and affiliation with the College; that is, whether the individual is faculty, student, or administration/staff, as well as which School within the College they are affiliated with (Arts and Sciences, Social Sciences, Economics and Business, Education and Human Ecology, or Natural Sciences). We also provided a category "Other", which would be chosen by staff or administrative officials who do not identify with any particular School (for instance, registrar and accounting

personnel, custodians, and dining hall employees would fall into this category). Approximately 32 percent of the respondents were in that category. Even though the breakdown by schools does not exactly mirror the breakdown for the College population, we feel that we have a suitable cross section of the College, as no single School or affiliation-type is disproportionately included. For instance, the School of Social Science is the largest of the five schools, and students make up the largest constituent group on campus. The same is true for our sample. Additionally, in contrast to Hindricks and Myles (2006), the participation rate among those in economics or business-related fields is *not* lower than that of the other disciplines, and the sample's proportion of students from this School is in line with the actual proportion on campus.

For the income, gender, and political affiliation categories (also in Table 1), we allowed for "No Response" to be chosen. In the following section, we run regressions with and without these variables. Of course, when they are included, we are forced to drop the observations without responses. We expect that income would be positively correlated with willingness-to-pay likelihood, as would leaning more to the left on the political spectrum. Around 3 percent of respondents did not provide their gender. At first glance, it would appear that we have a disproportionately large number of female respondents; however, our student body is approximately 60% female, so our sample appears to be in line with this characteristic as well.

We also believe that it is important to control for our respondents' stance on the issue of climate change. As shown in Table 1, around 86 percent believe it is an important public policy matter to address.

Delivery

A link to the online survey was available to students, faculty, staff, and administrators for two weeks during April of 2013. The survey link and description reached all members of campus electronically, and for some individuals via multiple channels. Prizes ranging from $10 to $100 were offered to reduce sample selection bias. Measures were taken to ensure that users could only complete the survey once, and that user IDs were kept separate from responses.

ANALYSIS OF RESULTS

In this section, we use binary response (logit) models to examine the factors correlating with willingness-to-pay likelihood, and we demonstrate how to extrapolate the survey results to the entire population of commuters in order to estimate the Scope 3 emissions category.

We reinforce the notion that we are not attempting to estimate the willingness-to-pay (demand) for emissions reductions (or, more generally, environmental quality), as is often the goal in contingent valuation studies. Instead, we use a logit model to examine which factors are correlated with willingness-to-pay *likelihood* across constituent groups on campus. In other words, our key goal of this analysis is to examine the characteristics of those who would support our proposal to allow voluntary contributions that would be used to offset emissions from commuting to and from campus over the course of the academic year.

The left-hand side variable in our regressions takes a value of 1 or 0, depending on whether (=1) or not (=0) the respondent was willing to offset his/her emissions (in their entirety) from commuting. The results are displayed in Tables 2 and 3. We divide the sample into students (Table 2) and faculty/staff (Table 3) since a series of LR tests suggest that there are differences between the two groups.[12] Recall that the damage calculation for each respondent is based on the number/length of trips and vehicle type; therefore, we do not include these variables in the regression models, as they would introduce multicollinearity.[13] Also recall that there may be concern about endogeneity bias in the damages coefficient, particularly in the faculty/staff regressions, since this group has more control over vehicle choice as it relates to their environmental preferences. However, we reiterate here that vehicle choice is strongly affected by exogenous factors, such as gasoline prices and government-sponsored buying incentives. Thus, we do not believe that endogeneity is a serious concern in the results that follow.

We first note that respondents' perceptions of the importance of climate change policy is positively correlated with being willing to contribute. This result is not surprising, and it holds in all models except model (3) for faculty/staff. Here, the inclusion of income and political affiliation causes "Importance" to become insignificant, as these variables have a higher correlation with each other for this group.

Additionally, when controlling for school affiliation and income/politics (the latter of which results in fewer usable observations due to the "no response" option), some interesting patterns emerge that are consistent across models (2) and (3). First, in Table 2, and in contrast to the findings of Hindricks and Myles (2006), we see that students in the School of Economics and Business are more likely to be willing to pay than others. This could be due to the fact that all students in the School of Economics and Business (regardless of their major) are required to take Principles of Microeconomics. In recent years, all

Table 2. Factors Correlating with Support among Students.

VARIABLES	(1) WTP (Yes=1)	(2) WTP (Yes=1)	(3) WTP (Yes=1)
Important (Yes=1)	1.375**	1.588***	3.601***
	(0.536)	(0.558)	(1.167)
Damages	-0.008**	-0.006	-0.006
	(0.004)	(0.004)	(0.005)
Arts & Hum.		0.401	-1.192
		(1.002)	(1.413)
Social Sci.		1.168**	1.286
		(0.564)	(0.840)
Natural Sci.		0.280	0.804
		(0.775)	(1.022)
Econ & Bus.		1.227**	1.635*
		(0.595)	(0.927)
Income			0.001
			(0.004)
Some conserv.			1.319
			(1.140)
Indep.			-0.271
			(1.076)
Some liberal			1.541
			(1.131)
Liberal			2.094*
			(1.152)
Constant	-1.292**	-2.394***	-5.350***
	(0.504)	(0.722)	(1.719)
Observations	138	138	88

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

instructors of this course have covered negative externalities and Pigovian taxes, with a particular focus on pollution-generating production activities. Second, in Table 3, we see that faculty from the School of Natural Sciences are more likely to be willing to pay to offset their emissions. A possible explanation for this finding is that there is greater breadth in training among faculty in Natural Sciences with respect to climate processes, since majors in this school include Chemistry and Biochemistry, Earth and Atmospheric Sciences, and Biology. Note that these results hold in the full regression that controls for income and political affiliation as well in the restricted model of column (2).

Income is (marginally) significant in the faculty/staff regressions, indicating that those with higher incomes are more likely to be willing-to-pay.[14] If environmental quality is a normal good, this is the result that would be expected. For students, on the other hand, we do not find evidence that income is

Table 3. Factors Correlating with Support among Faculty, Staff, and Administration.

VARIABLES	(1) WTP (Yes=1)	(2) WTP (Yes=1)	(3) WTP (Yes=1)
Important (Yes=1)	1.775**	1.871**	0.318
	(0.789)	(0.830)	(1.017)
Damages	-0.016***	-0.016***	-0.018***
	(0.004)	(0.004)	(0.005)
Arts & Hum.		0.008	-0.439
		(0.556)	(0.668)
Social Sci.		0.594	0.479
		(0.494)	(0.587)
Natural Sci.		1.545**	1.857**
		(0.629)	(0.859)
Econ & Bus.		0.137	1.302
		(0.891)	(1.314)
Educ & Hum Eco.		-0.272	0.166
		(0.915)	(1.023)
Income			0.007*
			(0.004)
Some conserv.			0.976
			(1.250)
Indep.			0.494
			(1.200)
Some liberal			2.050*
			(1.175)
Liberal			2.188*
			(1.146)
Constant	-1.306*	-1.594*	-1.964
	(0.781)	(0.826)	(1.364)
Observations	181	181	149

correlated with willingness-to-pay likelihood. This finding could be due to the fact that students are more likely to pass the cost of the contribution on to their parents, so the payment would not have much of an impact on their discretionary income.

In models (2) and (3), it appears that damages are not correlated with being willing-to-pay for students, but the effect is strong and negative for faculty/staff. This further supports the notion that the regressions should be run separately. Lastly, for both students and faculty/staff, those who are more left-leaning on the political spectrum are more likely to be willing to pay.

Kling et al. (2012) use the concept of “construct validity”: Do the results of the survey correspond to the results that theory would predict? For instance, people who think that climate change is a serious issue

should be more willing to contribute; liberals should be more likely to contribute; and, *ceteris paribus*, higher income respondents should be more likely to contribute. Our results support the claim that willingness-to-pay likelihood generally varies as anticipated. Thus, on the whole, it appears that respondents answered the survey questions truthfully.

Extrapolation of Results for Scope 3 Emissions Calculation

We gathered data on the number of parking permits issued to each group of commuters during the academic year covered by our survey. From the survey results, we calculate the average carbon emissions from each group. Since faculty and staff are more likely to live farther away from campus than are students, it is not surprising that the average emissions of students are the lowest among the three groups (Table 4). We then use the sample averages to calculate an estimate of the total emissions of each group by multiplying the sample average emissions by the total number of permits issued to each group. First, however, we should note that approximately 20 percent of student permit holders live on campus, and are thus excluded from the calculation. This is important so as not to overestimate the emissions of student *commuters*. An estimate of the total emissions of all commuters is then obtained by adding the emissions of each group. Note that a more accurate measure of emissions is obtained by splitting the groups up first and then applying the number of permits to each group rather than simply applying the grand sample mean of emissions per commuter to the overall number of permits issued.

By applying the social cost factors discussed in Section III, we obtain a dollar estimate of the total climate damages associated with all commuters' trips to campus of approximately $185,000. From the sample, we note that 40 percent of respondents stated that they were willing to pay for their damages. However, this does not mean that 40 percent of all *damages* from the sample are covered. When we look at the proportion of total damages paid for by those who stated a willingness to pay, we find that $3,396 out of $16,739 is covered (or 20 percent). Nevertheless, if commuters as a whole were willing to pay for 20% of the overall damages, then $37,000 (20 percent of $185,000) could potentially be raised to offset our campus's carbon footprint via voluntary contributions. To put this figure into context, consider that the average American produces around 36 tons of carbon per year. Services such as Terrapass allow for the purchase of carbon offsets. At the current individual offset price of $5 per ton, our proposal could generate enough funding to offset the carbon emissions of around 200 Americans.[15]

Table 4. Extrapolation of Survey Results to Scope 3 Commuter Emissions Category.

	(1) Average Emissions*	(2) Number of Permits	(3) Total Emissions
Admin/Staff	2.22	796	1,767.12
Faculty	2.97	1,082	3,213.54
Students**	1.38	1,766	2,437.08
			7,417.74

*Emissions are in metric tons of CO_2e.
**Approximately 20% of student permit holders live on campus and are excluded.

Additionally, since we only include those who answered “yes” to the willingness-to-pay question, these figures represent a lower bound on the willingness-to-pay for damages. As the regression results indicate, commuters with longer commutes and thus higher damages, *ceteris paribus*, are generally less likely to contribute. There are commuters in the sample accruing carbon damages of several hundred dollars over the course of the academic year. Such individuals are not likely to be willing to offset their emissions entirely, but might be willing to pay a lesser amount. This would explain the disjoint between the participation rate (that is, answering “yes” to the willingness-to-pay question) and the percentage of overall carbon costs that commuters are willing to offset. In the future, we may decide to include an open ended willingness-to-pay question, but we avoided doing so in our initial run of the survey for the reasons discussed above.

CONCLUSION

The results of our survey indicate that our College should implement a program that gives the purchasers of parking permits the option to make a voluntary additional payment to offset the carbon costs associated with their commutes to campus. The predicted response rate suggests that it would be a useful addition to the College's array of sustainability initiatives. Even if the College doesn't follow our policy advice, the results of our survey at the very least give the College a useful tool for estimating the total carbon emissions of commuters – a component of Scope 3 emissions which many institutes of higher education have had a difficult time measuring for their greenhouse gas inventory reports.

As academic researchers, we have a second motive for recommending the College adopt our proposal. Once the policy ceases to be a hypothetical proposal, we would be able to compare actual with predicted participation rates. This exercise would be a useful addition to the stated preference/contingent valuation literature.

Of course, we also hope that if our program is successful, PCC signatories will follow our lead and implement similar programs. In this vein, we would encourage researchers at other institutions to administer surveys similar to ours. While we believe we have developed a suitable framework for estimating the carbon emissions (and the willingness-to-pay for them) of commuters, replication would provide another avenue for verifying whether our findings are reasonable. If others are interested in administering a similar survey on their campuses, we have some suggestions on how our questionnaire can be improved. As noted above, at the end of the survey was a "Comments" section in which respondents were free to discuss any areas of the survey which may have been unclear to them, or areas in which they would like to have had more options. Although the majority of the comments stated that the survey was in fact clear and easy to take, there are a few points worth noting. First, respondents commented on the set of vehicles from which they could choose. Several respondents stated that would like to have had separate choices for small and large sport utility vehicles (rather than just one category), while others wanted to see an option for a motorcycle. Second, several respondents commented that we need a better way to deal with people who *sometimes* commute and *sometimes* take the bus/walk/carpool (i.e. we need a better measure for the *frequency* of commuting). Third, a few respondents stated that they do not always directly travel from home to campus; sometimes, they are traveling from work to campus or vice versa. This would introduce some measurement error in our analysis, as commuting to campus is not always necessarily the primary purpose of the trip. We had overlooked these options in constructing the first round of the survey, and if the College asks us to conduct a second survey, we will be sure to incorporate trip-chaining, additional vehicle choices, and more possibilities for getting to and from campus to enhance the accuracy of the survey results.

As a suggestion for future research, a common theme in the contingent valuation literature is if survey respondents are convinced that their answers will have real consequences, they will be more likely to respond truthfully. A variation of our survey would inform the participants that if the campus does not reduce its carbon footprint through voluntary means, it will resort to more draconian measures, such as by

restricting parking spaces or raising permit prices. A possible strategy would be to follow Boyce et al. (1992) and have one group that is clearly informed of the consequences and one that is not to see if there are significant differences in willingness-to-pay between them.

Lastly, future studies may aim to identify the demand for emissions reductions. One approach would be to simultaneously model damages and willingness to contribute. More directly, one could introduce exogenous bids to the survey design.

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ENDNOTES

1. http://www.nyseg.com/YourBusiness/newwindenergy/newwindenergycomm.html
2. http://secondnature.org/
3. Some institutions have utilized transportation surveys to estimate commuters' emissions; however, we are unaware of any attempts to assess whether commuters are willing to pay for these emissions.
4. Although we do not do so in the survey presented here, one might include a question asking whether these are important factors affecting the respondent's (un)willingness to participate.
5. There were 3,644 commuter permits issued during the academic year in which the survey was administered.
6. The authors thank Eric Blau and Jen-Ting Wang for providing the response rates for these other surveys conducted on our campus.
7. The survey does not include commuting during the summer months, but this would be a simple extension to the questionnaire we administer.
8. https://www.epa.gov/fueleconomy
9. A more sophisticated questionnaire might separate highway and city commuting; otherwise, the mileage figures could be inaccurate for short-distance commuters. However, our mean commute is 11.6 miles (as shown in Table 1), and therefore total emissions appear to be dominated by longer-distance commuters. We thank an anonymous referee for suggesting this clarification.

10. See https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references and https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf. Since our survey covers the 2012-2013 academic year, we use the average social cost between 2010 ($21.40) and 2015 ($23.80).

11. There may be some concern that "environmental impact" and "climate damages" (the latter of which is what we are capturing with our $0.20/gallon figure) are being conflated here, even though the Preamble to the survey does use the phrase "carbon footprint". For instance, *overall* environmental impacts include localized pollution (smog) due to excessive idling of vehicles. However, given that our college is located in a rural area with a relatively small population, traffic congestion is minimal, so that the environmental impact of commuting comes largely in the form of our carbon footprint. In fact, our region consistently ranks well below state and national averages for the presence of particulates. For surveys of this type that are conducted in more highly populated and urban areas, we suggest specifying "climate damages" in the question posed to respondents, or else modifying the calculation to include particulates and other localized damages. We thank an anonymous referee for suggesting that we make this distinction.

12. When we allow only the intercept or both the intercept and slope of damages to vary, the null hypothesis of the student model being nested in the full model (with school controls) is rejected at the 90% confidence level. The results of these and other LR tests are available upon request.

13. We also do not include gender in our regressions since the "no response" option further reduces the set of usable observations, which are already reduced when we include income and political affiliation. We include gender in the summary statistics of Table 1 to demonstrate that our sample makeup is in line with the gender proportions in the student body. We did, however, run the models with gender included. The results are qualitatively similar and are available upon request. Additionally, one respondent identifying as a student selected "other" for affiliation with the College. Since the survey indicated that this category was to be selected by certain staff/administration only, this observation was dropped in the regressions of Table 2.

14. We treat income as a continuous variable in the regressions by using the midpoint of each income category chosen by respondents.

15. https://www.terrapass.com/product/productindividuals-families

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Homeownership and Voting Behavior: A Two-Stage Analysis Using Data from the American National Election Studies

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ABSTRACT

The purpose of the present study is determine if homeownership has an effect on the probability of voting in a general election in the United States. A model of voter participation is estimated using both a simple probit and a two-stage regression technique. The data used in the present study is obtained from the American National Election Studies program (ANES) and is one of the largest and most recent data sets used in an analysis of the effects of homeownership on voting behavior. The results of this study suggest that homeownership is positively correlated with voting. These results hold even after controlling for the endogeneity of homeownership

INTRODUCTION

Due to the tangible and durable investments that homeowners have made in their communities, homeownership may result in increased levels of investment in social capital (DiPasquale and Glaeser, 1999; Drier, 1994; Kingston, Thompson, and Eichar, 1984). One manifestation of this increased social capital is greater voter participation. Given that homeowners have tangible ties to their communities and are the beneficiaries of positive financial returns to their properties, it is reasonable to assume that homeowners will be more involved in their communities and will be more likely to vote in elections. Renters, however, do not invest as much in social capital because they do receive any of the financial returns from the property that they are renting; hence renters are assumed to be less involved in their communities and thus less likely to vote.

Another possible explanation for this increased interest in voting on the part of homeowners is the interest theory. According to Cox (1982), homeowners have a greater stake in voting because governmental policies may affect the value of their homes. Therefore, homeowners are more likely to vote in elections in order to influence the passage of government policies that will protect the values of their homes.

Finally, homeowners' increased interest in voting may be due to the fact that homeowners are much less mobile than renters. Because of this geographic stability, homeowners have a much greater interest in government policies that may affect their property values. If government policies such as decreased road maintenance or irregular trash removal negatively affect the desirability of a neighborhood, then the values of homes in these neighborhoods may decline, thus resulting in financial losses for homeowners.

Hence, all of the above theories suggest that homeowners should have greater interest in voting than renters. Unfortunately, prior research on this topic has yielded mixed results. DiPasquale and Glaeser (1999), Drier (1994), and Kingston et al. (1984) all found that homeowners tend to vote more frequently

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than renters, although the effect is somewhat muted when the endogeneity of homeownership is taken into account. Pattie, Dorling and Johnston (1995), Saunders (1978), and Kemeny (1977) found that homeowners tend to vote for the more conservative candidates. Similarly, Pratt (1987) found that homeowners are more likely to adopt white-collar political values. Steinberg (1981), Alford and Scoble (1968), and Sykes (1951) note that homeowners are more actively engaged in their communities. Blum and Kingston (1984) found that homeowners are also more likely to be involved in their local communities and to vote for the establishment candidates. Other research, however, has found that homeownership has little to no effect on political beliefs or voting behavior (Gilderbloom and Markham, 1995; Kingston and Fries, 1994; Kingston et al., 1984)

Engelhardt et al. (2010) found that homeownership does not affect political activity when homeownership is assumed to be endogenous. According to Engelhardt et al. (2010), the primary reason why homeownership should be considered endogenous is because persons with low rates of time preference may have greater incentives to both buy a house and to engage in political activity. Persons with high rates of time preference, however, may be less inclined to engage in such long-term investments. Hence, given that low rates of time preference may affect long-term investment decisions, it can be assumed that homeownership is not exogenous but is simultaneously determined with voting behavior.

In prior studies that assumed that homeownership was endogenous, several different instrumental variables were used in order to control for this endogeneity. In DiPasquale and Glaeser (1999), the instrumental variable used was the state-level homeownership rate within the same race and income group. In Engelhardt et al. (2010), the instrument used was a randomly assigned treatment status variable for low-income households from Tulsa, Oklahoma for the period 1998-2003. The authors noted however that, since individuals self-selected into this program and only low-income persons were allowed to participate, the treatment status variable was probably not random.

In the present study, a model of voter participation is estimated using both a simple probit and a two-stage regression technique. This study differs from prior research in several ways. First, the data used in the present study were obtained from the American National Election Studies program (ANES). Only one other study on voter participation used this data (Kingston et al., 1984), and, in that study, only data for the year 1976 were used. The present study uses many more years of data and very recent data. Second, an instrumental variable similar to that used in Dipasquale and Glaeser (1999) was employed. Although the present study does not breakdown the instrumental variable by race or income, a regional homeownership rate variable is used that should control for any potential endogeneity that may be present in the homeownership variable. In addition, Dipasquale and Glaeser (1999) used a different data set than the ANES.

Thus the present study should provide a compelling test of the robustness of the homeownership instrumental variable used in Dipasquale and Glaeser (1999). Finally, the present study looks at voting in both Presidential and off-year elections, thus providing a richer model of voter participation. Results of the present study suggest that homeowners are more likely to vote, even after controlling for the endogeneity of homeownership. This study is significant because it uses a large national data set spanning many years and obtains the same results regardless of the model employed. The next section presents the empirical technique and data used in the present study. The last section presents the results and concluding remarks.

EMPIRICAL TECHNIQUE AND DATA

As noted earlier, homeowners have an interest in improving their communities because community quality is capitalized into the values of their homes (DiPasquale and Glaeser, 1999). Given their interest in improving their communities, homeowners have a greater incentive to vote than renters. It is important to note, however, that the individual-level qualities that encourage investment in residential real estate may also create incentives to participate in elections. Hence, homeownership is not exogenous with respect to voter participation. In order to control for this endogeneity, it is necessary to use an instrumental variable that is not correlated with voting. Prior studies have used several different types of instruments. DiPasquale and Glaeser (1999) used state-level rates of homeownership broken down by race and income. Engelhardt et al. (2010) used a nonrandom treatment variable for participants in a program that assisted low-income individuals in saving for a home. The present study uses an instrumental variable similar to that used by DiPasquale and Glaeser (1999), except that regional-level, and not state-level, homeownership rates are used. The reason for using a more aggregate rate of homeownership is because, in the data set used in the present study, there were very few observations (sometimes fewer than 10) for some states. Thus, calculating homeownership rates from such small samples would be problematic. Therefore, regional homeownership rates were used instead. It is reasonable to assume that these homeownership rates would not be related to an individual-level decision regarding voting behavior.

In addition to the endogeneity of homeownership and the impact of homeownership on voting behavior, prior research has indicated that various socioeconomic factors should be used as control variables in the estimation of voting behavior. Many of these variables serve as proxies for rates of time preference. As noted earlier, individuals with low rates of time preference are more likely to make long-term investments in their communities and are more likely to vote than are persons with high rates of time preference. Hence, prior research has used the following as control variables in the estimation of the determinants of voting behavior: age, sex, education, income, and political party affiliation ideology.

Given the above, the following equations were estimated in the present study:

Stage 1: $\text{Homeownership} = \alpha_0 + \alpha_1 (\text{Regional Homeownership Rate}) + \alpha_2 (\text{Control Variables})$

Stage 2: $\text{Voting Behavior} = \beta_0 + \beta_1 (\text{Estimated Homeownership}) + \beta_2 (\text{Control Variables})$

In the above equations, Homeownership equals one if the individual is a homeowner and zero otherwise, and Voting Behavior equals one if the person voted in the November election, and zero otherwise. The Regional Homeownership Rate is the rate of homeownership for each region (Northeast, North Central, South and West) for each year examined. It is assumed that this instrument is not correlated with voting behavior. Although the Regional Homeownership Rate may fluctuate with regional economic activity, it is assumed that homeownership rates are less variable than most other economic indicators. In addition, this variable should not be correlated with the other explanatory variables primarily because all of the other explanatory variables are at the individual level.

The control variables used in both equations include, age, sex, educational attainment, income, regional residence, union membership, religion, marital status, political party affiliation, a year trend variable, and a Presidential election dummy variable. It is expected that any variable that is indicative of a low rate of time preference (including homeownership) would have a positive effect on voting behavior. It is also assumed that individuals with certain characteristics would be more or less likely to vote due to societal norms or latent discrimination. Finally, it is assumed that individuals will be more likely to vote in Presidential elections than in other elections

All data used in the present study were obtained from the American National Election Studies (ANES). The ANES is a collection of survey data that is obtained during the years of national elections. It is a collaboration of Stanford University and the University of Michigan and is supported in part by funding from the National Science Foundation. For the present study, data for the following years were used: 1952, 1964, 1968, 1970, 1972, 1974, 1976, 1978, 1980, 1982, 1984, 1986, 1988, 1990, 1992, 1994, 1996, 1998, 2000, 2004, 2008, and 2012. After deleting all observations with missing data, the final sample size was 37,087. The sample size per year ranged from 924 to 5,148. The data set used in the present study is one of the largest and most up-to-date ever used in an analysis of the effects of homeownership on voting behavior.

Regarding a few of the more relevant survey questions used in the present study, the homeownership variable question is:

VCF0146: (Do you/Does your family) own your own home, pay rent or what?

1. Yes, own.
2. No, not owned.

The voting behavior question is:

VCF0702: Did R Vote in the November Elections?

1. No, did not vote.
2. Yes, voted.

RESULTS AND CONCLUDING REMARKS

Descriptive statistics are presented on Table 1. These statistics indicate that homeowners, on average, vote more often than renters. On average, 75.5 percent of homeowners voted in a November election, while only 56.5 percent of renters voted. Table 2 presents the results obtained from a simple probit regression. Tables 3 and 4 present the results from the two-stage regression.

Table 1
Descriptive Statistics

Variable	Mean	Standard Deviation
Voting Behavior	0.693	0.461
Homeowner	0.672	0.469
Male	0.456	0.498
Income (0 - 33 percentile)	0.334	0.472
Income (34 - 67 percentile)	0.338	0.473
Income (68 - 95 percentile)	0.276	0.446
Northeast residence	0.183	0.387
North Central residence	0.266	0.442
South residence	0.356	0.478
Employed	0.597	0.49
Union member	0.205	0.403
Protestant	0.595	0.49
Catholic	0.238	0.426
College educated	0.212	0.409
Married	0.599	0.49
Single (never married)	0.149	0.356
Democrat	0.399	0.489
Republican	0.251	0.433
Presidential election	0.666	0.471

Table 2

Simple Probit Regression – Voting Behavior

Variable	Coefficient	Test Statistic	Marginal Effect
Intercept	-6.47	-6.22***	
Homeowner	0.479	24.91***	0.128
Male	0.0479	3.13***	0.01445
Income (0 - 33 percentile)	-0.434	-10.52***	-0.137
Income (34 - 67 percentile)	-0.251	-6.29***	-0.0763
Income (68 - 95 percentile)	-0.101	-2.52**	-0.0307
Northeast residence	-0.0154	-0.63	
North Central residence	0.0265	1.18	
South residence	-0.302	-14.26***	-0.093
Employed	-0.0427	-2.66***	-0.0129
Union member	0.0218	1.13	
Protestant	0.165	7.67***	0.0499
Catholic	0.154	6.40***	0.0456
College educated	0.604	28.22***	0.168
Married	0.027	1.43	
Single (never married)	-0.119	-5.07***	-0.0365
Democrat	0.447	26.66***	0.132
Republican	0.446	22.65***	0.128
Presidential election	0.623	40.78***	0.20
Year	0.00311	5.96***	0.00094

10% significance = *; 5% significance = **; 1% significance = ***

Log-likelihood function = -19792.73

Table 3

First Stage Regression – Homeownership Status

Variable	Coefficient	Test Statistic	Marginal Effect
Intercept	-15.68	-15.29***	
Regional Homeownership Rate	3.09	17.59***	0.951
Male	0.0155	1.02	
Income (0 - 33 percentile)	-1.26	-28.53***	-0.411
Income (34 - 67 percentile)	-0.811	-18.78***	-0.24
Income (68 - 95 percentile)	-0.373	-8.53***	-0.113
Northeast residence	0.00562	0.24	
North Central residence	-0.00827	-0.28	
South residence	0.113	5.22***	0.0345
Employed	-0.255	-15.98***	-0.0775
Union member	0.126	6.50***	0.0383
Protestant	0.233	11.17***	0.0725
Catholic	0.26	11.11***	0.07786
College educated	-0.0142	-0.72	
Married	0.406	22.53***	0.132
Single (never married)	-0.332	-14.76***	-0.108
Democrat	0.0528	3.18***	0.0162
Republican	0.229	11.68***	0.06933
Presidential election	-0.0194	-1.25	
Year	0.00732	14.49***	0.00226

10% significance = *; 5% significance = **; 1% significance = ***

Log-likelihood function = -20185.95

Table 4
Second Stage Regression – Voting Behavior

Variable	Coefficient	Test Statistic	Marginal Effect
Intercept	-5.61	-4.96	
Homeowner (estimated from first stage)	0.6064	3.90***	0.186
Male	0.0454	2.99***	0.0139
Income (0 - 33 percentile)	-0.362	-5.16***	-0.115
Income (34 - 67 percentile)	-0.213	-4.22***	-0.0659
Income (68 - 95 percentile)	-0.0883	-2.12**	-0.0272
Northeast residence	-0.0184	-0.76	
North Central residence	-0.0069	0.25	
South residence	-0.311	-13.11***	-0.098
Employed	-0.0255	-1.24	
Union member	0.014	0.70	
Protestant	0.148	6.12***	0.0456
Catholic	0.135	5.01***	0.041
College educated	0.594	28.14***	0.168
Married	-0.00036	-0.01	
Single (never married)	-0.091	-3.02***	-0.0282
Democrat	0.438	26.20***	0.131
Republican	0.427	19.38***	0.125
Presidential election	0.616	40.89***	0.201
Year	0.0026	4.40***	0.186

10% significance = *; 5% significance = **; 1% significance = ***
Log-likelihood function = -20095.47

The probit results suggest that homeowners are more likely to vote than renters. The predicted probability of voting is 12.9% greater for homeowners than for renters. This result corroborates the findings of other studies. In addition to the positive effects of homeownership, men, Protestants, Catholics, college-educated persons, Democrats, and Republicans are all more likely to vote than others. Lower-income persons, people who live in the South, the unemployed, and single persons are less likely to vote than others. In addition, the marginal effect of homeownership is the largest of any explanatory variable. Hence, homeownership is one of the most important determinants of voting.

In order to control for the possible endogeneity of homeownership, a two-stage analysis is estimated. The first stage estimates the determinants of homeownership. The regional homeownership rate, which is the instrumental variable, was significant and positive in this first stage regression. In the second stage

regression, it was found that homeownership has a significant and positive effect on voting behavior. The probability that a homeowner votes is 18.6 percent greater than the probability that a renter votes. This estimated difference in probability is similar to the result obtained from the simple probit regression. Hence, even after controlling for the endogeneity of homeownership, it was found that homeowners are more likely to vote in national elections than renters. Regarding the control variables, men, Protestants, Catholics, college-educated persons, Democrats, and Republicans are more likely to vote than others. Lower-income persons, persons living in the South, and single persons are less likely to vote than others. These results are the same as those found in the simple probit regression. In addition, the effect of homeownership on voting behavior is very similar to that found in DiPasquale and Glaeser (1999). DiPasquale and Glaeser found that the probability that a homeowner votes is 18.3 percent greater than the probability that a renter votes.

In conclusion, the results of the present study corroborate the findings of some earlier research on this topic in that homeownership is found to be positively correlated with voting. Clearly, these results, which hold even after controlling for the endogeneity of homeownership, suggest that the interest theory of social capital and the geographic stability of homeowners all contribute to greater participation in elections on the part of homeowners. Hence, if greater political participation is a national priority, then government policies that increase the rate of homeownership would be in the national interest. Policies such as the tax deductibility of mortgage interest, the public underwriting of mortgages, and low-interest loans for veterans and qualified first-time homebuyers would all encourage homeownership, which in turn should increase electoral participation.

Recent trends in homeownership, however, combined with the results of the present study, suggest that the percentage of citizens voting in future elections may decline. Homeownership rates were approximately 64 percent in the late 1960s. These rates stayed relatively constant until the early 2000s when they increased to about 69 percent. Starting in 2007, however, homeownership rates began to decline, primarily because of the recession and increased lending standards imposed by banks. In the first quarter of 2014, homeownership rates had declined to 64.8 percent.

Due to this rather dramatic decline in homeownership rates, it is reasonable to assume that voting will also decline, especially given that the results of the present study indicate that the probability of a homeowner voting is anywhere from 12.8 percent to 18.6 percent greater than a renter voting. Combining that estimate with the increased probability that politically-affiliated voters (Democrats and Republicans) are also more likely to vote than independents, one can envision a future political landscape where fewer but more ideological-motivated persons are voting in national elections, thus creating situations where politically divisive and uncompromising individuals are elected to Congress and the Presidency. Such outcomes may result in greater political gridlock and less governmental activity on many issues, both foreign and domestic. Clearly, one way to lessen the probability that political gridlock will occur is to enact political and economic policies that increase the rate of homeownership so as to increase the social capital of individuals and thus motivate them to engage more fully in electoral politics. Given the importance of this issue, more research is warranted in this area.

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Health Insurance: Most Effective When Not Used? A Proposal For Healthcare Reform

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ABSTRACT

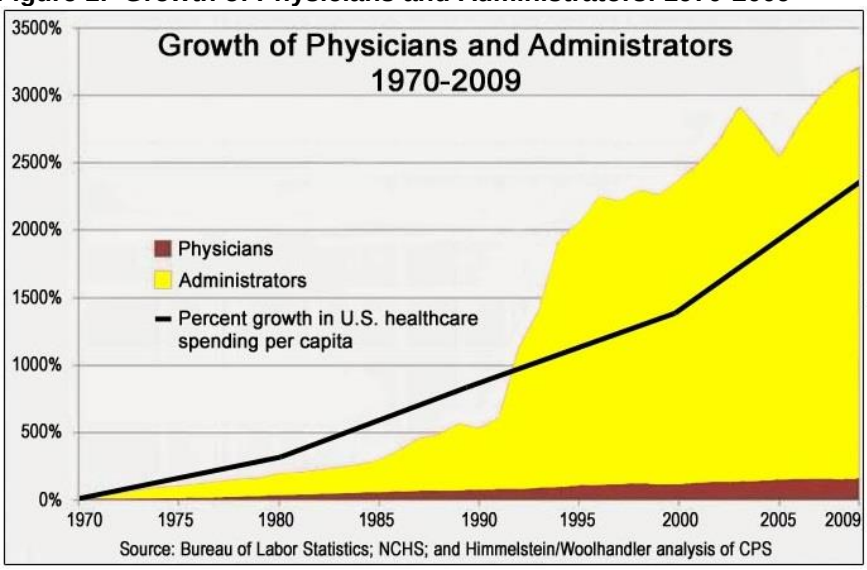
Eighty-nine percent of U.S. health expenditures are paid by third-parties. Yet in Singapore with universal healthcare and higher per capita GDP, third-parties pay only 42 percent because households use Health Savings Accounts to pay providers directly, promoting efficiency and competition and medical prices 70 percent lower than U.S. prices. This paper offers a policy proposal that achieves Singapore levels of direct pay, overcoming high U.S. medical prices, unfavorable income distribution and other constraints, by utilizing flexible deductibles based on HSA balances, subsidies, and lines of credit. Non-elderly households receiving third-party payments are reduced from 83 to 10 percent and non-elderly third-party expenditures to 40 percent.

INTRODUCTION

The problem under third-party payment systems, such as health insurance, is that the recipient does not have the incentive to control costs since the third-party makes the payments rather than the recipient. In the U.S., the effort to control these third-party payer costs, whether government or private health insurance, has primarily relied on administrative methods that monitor virtually every transaction for necessity, efficacy, and potential fraud or waste. The result has been a dramatic increase in health care administrative costs as illustrated in Figure 1 (Borders, 2017), which shows the total growth of physicians, administrators, and health care costs since 1970.

As can be seen in this graph, the growth in administrators has dwarfed the growth in physicians. The Kaiser Family Foundation (Kaiser, 2011) estimates administrative costs are 17 percent of health costs. According to Mediscape's Physician Survey (Mediscape, 2012), over 56 percent of doctors spend more than 10 hours of their own time each week on administration; with 28 percent spending more than 15 hours each week. Most of this time is required to complete third party payer paperwork or to follow the accepted method of treatment these payers require (Salwitz, 2014). The administrative costs of complying with insurance and government mandates also increase the benefits of consolidation—and thus reduced competition—in the health care market. As compliance costs increase, firms and doctors find it beneficial to merge or consolidate to reduce the duplication of compliance efforts. The increased consolidation reduces competition in markets and likely leads to higher medical costs.

Figure 1: Growth of Physicians and Administrators: 1970-2009



However, administrative methods are not the only method of controlling health expenditures. Health Savings Accounts (HSAs) were created to foster competition and control costs without significant administrative oversight. HSAs require households to cover more of their own medical expenses before insurance pays. These high deductible plans are designed to give households an economic incentive to control their medical expenses and to shop around for lower cost healthcare options; fostering competition and reducing administrative costs. Yet, in the U.S. only 11 percent of medical expenses are paid directly by the household (CMS, 2015) and even among high deductible insurance holders, 80 percent still receive insurance distributions (Fronstin, 2014). These data show that the ability of HSAs to control costs is likely to be very limited since so few transactions are directly paid by households. Singapore, by contrast, relies much more heavily on the use of Health Savings Accounts. In Singapore, households are required to put 6-8 percent of their income into a health savings account system called Medisave (Hsiao, 1995) resulting in Singapore households directly paying for 58 percent of their medical expenses. Thus third-parties only pay 42 percent of medical expenses (Reisman, 2006). This HSA account driven system seems to be effective at controlling costs while maintaining quality. Singapore only spends 5 percent of GDP on health expenditures; half of UK expenditures and one third of U.S. expenditures while being named by Bloomberg Media as the healthiest country in the world and named by Economist Intelligence Unit as one of the most efficient healthcare systems in the world (Lim, 2017).

However, as currently constructed in the U.S., HSAs only affect a small number of transactions and while these higher deductibles have reduced insurance company payouts, they frequently have not reduced the number of transactions that insurance companies monitor or control since many insurers require claims be filed by health providers even if the insurance company is not providing payment. The rational for this action is that the sooner a policy holder exhausts its deductible, the sooner the insurance company will have to pay and the sooner the household loses all incentive to control costs.

While the system in Singapore enables households to directly pay for most of their medical procedures, the question this paper seeks to answer is whether a system can be devised that would drastically increase direct household payments in the U.S. even though we have different demographics, income distribution, current levels of medical usage, and higher medical prices. For example, medical prices in the U.S. for 21 common procedures (Medicaltourism.com, 2017) cost an average of $32,513 in the U.S. versus only $9,695 in Singapore. Income distribution is also less dispersed in Singapore The wealth gap, the ratio of median and average income is much higher in the U.S. 7.09 versus only 2.72 in Singapore (Straits Times, 2017) and Singapore has a higher GDP per capita of $57,596 versus $45,759 for the U.S. (Nationmaster, 2017). These figures indicate that households in Singapore are in a better financial position to directly pay their own medical expenses.

This paper proceeds as follows: In section 2, I examine previous research. In section 3, I outline the proposal. First, I examine current U.S. medical expenditures for the potential for increasing household direct payments, then I outline the subsidies, lines of credit, and other requirements for a new type of HSA. Next, I describe how flexible deductibles are utilized in my proposal and then explain why allowing households to withdraw a portion of their HSA funds for their own pursuits provides cost control incentives. In sections 4-6, I describe the model used to evaluate this proposal, the data used, and the results of the model including an examination of the program's cost. In section 7, I draw conclusions from the results and examine areas for future research.

2. LITERATURE REVIEW

There has been considerable research into whether HSAs in the U.S. reduce medical expenditures. For example, Fronstin (2013) performing a five year analysis showed that high deductible plans only showed reductions in expenditures in the 3rd quartile of expenditures while Lo Sasso et al. (2010) found HSA enrollees spent roughly 5–7 percent less than non-HSA enrollees and Waters (2011) found HSAs reduced emergency room use, but increased prescription medication use and caused no change in overall outpatient expenditures among high deductible policy holders.

While there are many other papers examining the impact of HSAs on U.S. medical expenditures, most seem to be similar to this sampling; finding either no benefit, or limited benefits. These results are unsurprising given the small percentage of transactions that might be influenced by HSAs when 80 percent of high deductible policy holders receive insurance distributions each year. As Deber et al. (2004) described when analyzing a proposal to create HSAs as part of Canada's national health system: "Because most of the population is relatively healthy and uses few hospital and physician services, inducing the general population to spend less (on relatively small expenditures covered by small HSAs) will not yield substantial savings (p.63)." That is, since the HSAs affect so few transactions, they do not affect larger expenditures where greater savings might be obtained.

Closer to the issue examined in this paper is research by Dong (2006) and Yu (2017). These authors examine China's attempts to copy Singapore's HSAs system. China's pilot programs require households to contribute 8 percent of household income which is essentially identical to the 6-8 percent required by Singapore. Dong examining the early implementation of HSAs in Shanghai concluded that the Singapore's system would not work well in areas, like Shanghai, with high unemployment rates, a high percentage of low wage workers, and a relatively high percentage of elderly households. However, the main problems described by the author in Shanghai resulted from government failure to pay hospitals for catastrophic care and not from the use of the HSAs. Yu (2017) examined China's HSA pilots and found that HSAs do have an impact on medical expenditures. Yu estimates the price elasticity for medical services under these larger scale HSAs is between −0.42 and −0.58. This "relatively high price elasticity suggests that HSAs as an insurance feature may help control costs (p.773)."

Also relevant to this paper is whether HSAs can induce households to shop around for lower costs options. Sood et al. (2013) found that of the nine services examined, HSA households in the U.S. only shopped around more than traditional insurance holders for office visits as evidenced by lower claims and the more frequent use of low cost providers. This result is not unexpected given that HSAs in the U.S. only cover these smaller types of transactions not paid by insurers. What is important from this research is that U.S. households did shop around for purchases, at least for purchases influenced by the current size of HSAs. As Yu's research indicates, when HSAs are expanded to Singapore levels, households did demonstrate sensitivity to medical prices.

None of the research to date examines whether Singapore levels of direct payments could be achieved in the U.S. given the differences in demographics, income distribution, current levels of medical usage, and medical prices. This paper seeks to fill that void.

3. OVERVIEW OF DISTRIBUTION OF U.S. HEALTH EXPEDNITURES

To understand whether expanded HSAs in the U.S. would enable households to directly pay for a large percentage of medical expenditures, we must first examine the current distribution of medical expenses. Using data from the 2014 Medical Expenditures Panel Survey (AHRQ, 2017), the percentiles of medical expenditures by age and sex were calculated. These health expenditures include expenditures paid by both the individual and by third-party payers. These health expenditures also include expenditures typically not covered by insurance including dental and cosmetic surgery. These results are show in Table 1 below.
These figures suggest that if, for example, 27-45 year old males could afford to pay $4,643 "out of their pocket" (and if insurers did not require a claim to be filed when paying "out of pocket") then fewer than 10 percent of these individuals would need to file an insurance claim. Further, if 27-45 year old males could afford to pay $10,135 "out of pocket", fewer than 5 percent would have to file a claim.

Table 1: Distribution of Health Care Expenditures under age 65, 2014 ($/year)

Percentile	Under 65 Both Sexes	0-26 Both Sexes	27-45 Male	27-45 Female	46-64 Male	46-64 Female
50th	$686	$449	$293	$910	$1,367	$2,131
60th	1,119	689	534	1,442	2,217	3,260
70th	1,965	1,063	945	2,345	3,654	4,947
75th	2,628	1,368	1,424	3,036	4,488	6,176
80th	3,580	1,862	2,004	4,152	6,256	7,914
85th	5,075	2,667	3,055	6,246	9,334	10,820
90th	7,895	4,063	4,643	10,083	14,118	15,985
95th	15,301	7,195	10,135	16,618	27,076	25,988

Of course, an “out of pocket” bill of over $10,000 would be very difficult or impossible for many households to pay. While a household could accumulate this amount of savings in an HSA over time, U.S. households generally have not been making these contributions so their HSA accounts would not be large enough to pay these types of large expenses, at least initially. Therefore, any HSA system hoping to expand levels of direct pay must address this low initial account balance problem.

3.1 NEW TYPE OF HEALTH SAVINGS ACCOUNT

To address these issues I propose that a new type of HSA be created in the U.S: a Health Savings Account Plus (HSAP). The HSAP would be administered using the current HSA structure. Financing for the HSAP would come from four different sources: household contributions, tax rebates, a line of credit, and insurance rebates. Household contributions would be limited to 5 percent of household income because research by Galbraith (2011) shows that sustained expenses above 5 percent of household income creates significant financial hardship. To enable even lower income households to directly pay a significant portion of their medical expenditures and to address the low initial account balance problem, tax rebates would be used to augment household contributions and a line of credit equal to the sum of three years of tax credits and household contributions and 15 percent of household income would be created to allow households to pay large medical expenses by spreading these costs over more years. The line of credit was capped so that households would be able to quickly repay these funds using their contributions and tax rebates. Participants in the HSAP agree to use their available HSAP funds before accepting insurance or Medicaid. Relieved of these expenditures, insurance companies would be expected to offer rebates based on a predetermined schedule for various HSAP balances; with larger refunds for larger HSAP account balances. These insurance rebates could be stipulated by insurance companies in their policies with a schedule of rebates earned for each HSAP balance. Alternatively, each state’s insurance regulatory board could stipulate the level of rebates based on actuarially determined amounts. In exchange for participation,

households would receive payroll tax rebates based upon their age: $2000 for those 46-64, $1500 for those 27-45, and $500 for those under 27.

As long as households maintained a balance over some threshold, 100 percent of unused household contributions and tax rebates would be refunded annually along with 45 percent of unused insurance rebates. The threshold used in this paper was set to one year's worth of rebates and household contributions. The threshold and tax rebates were strategically set so that 90 percent of households could directly pay their medical expenditures using their HSAP. The reasoning for the level of these cash withdraws allowed is explained later in this paper. Finally, to encourage the use of direct payments by households using their HSAP, medical providers would be required to provide services for those using their HSAP, or cash, at prices equal to or lower than the price paid by any insurer for that service.

3.2 INSURANCE COMPANY REBATES AND FLEXIBLE DEDUCTIBLES

One barrier to households being willing to directly pay a larger portion of medical expenses is the current connection between HSAs and deductibles. Currently, insurance is constructed where households must stipulate or employers must choose for all their employees a standard annual deductible. For households under employer-provided insurance, the choice of deductibles is determined by the employer. While many employees might prefer a larger deductible, the employer has to choose a deductible that is acceptable to the majority of its employees. This results in many employees who would be willing to directly pay more of their own medical expenditures being stuck with a deductible lower than they would prefer. Additionally, many households might be willing to directly pay for a greater portion of medical expenses if their risk was capped; however, as currently constructed, a higher deductible obligates the household not only to cover a one-time expense up to the deductible but repeatedly cover that deductible should they have expenses exceeding the deductible in subsequent years. This is why, under the current system, even a household with, for example, $10,000 in its HSA, might choose an insurance plan with only a $1500 deductible. They may have the ability and the willingness to take the risk of a large one-time medical expense but not repeated ones.

To address this issue and to utilize the current system of insurance, I propose that the amount each participating household is expected to pay before accepting insurance be set at the balance of its HSAP at the beginning of each year. In this way, the deductible is flexible. If the household suffers a large medical expense in year one, the amount it will be expected to pay before utilizing insurance will be lower the following year. For example, suppose a household starts a year with a $20,000 balance in its HSAP but with other contributions the balance increases to $28,000 by the end of the year. Now suppose the household suffers a medical expense of $45,000. The household pays $20,000 out of its HSAP, that year's beginning balance, and the insurance company covers the remaining $25,000. In the following year, since the beginning balance in the HSAP is only $8,000, this household would only have to cover the first $8,000 of its medical expense; i.e. its "deductible" adjusted.

3.3 "WITHDRAWABILITY" TO CONTROL COSTS AND CONTROL ADVERSE SELECTION

Households under this proposal are allowed to withdraw funds above the threshold to create an incentive for them to control costs and to seek lower cost options. This is one of the goals of the current HSA system. However, the current HSA system may not be very effective at creating these incentives because households may place little real value on money in their HSAs because the use of that money is constrained. Under the current system, any money households save on medical expenditures can only be used to pay for some future medical expense—except at retirement when the funds can be withdrawn for any use. Therefore, under the current system, unless one lives long enough to withdraw HSA money at old age, any savings will not affect the quality of life this year or for the foreseeable future; reducing the household's incentive to control expenses.

Setting the proper percentage of HSAP funds that can be withdrawn involves a tradeoff between two conflicting policy objectives. A higher withdraw rate increases the incentive for households to control medical expenses but reduces the amount of savings available in the HSAP to pay for future medical expenses and thereby reduces the percentage of expenditures directly paid by households. Here is how I propose to balance the two considerations. To give HSAP holders an incentive to control expenses, I propose returning 100 percent of tax rebates and contributions not used for medical expenses to the household to spend on any purchase. To ensure households have adequate funds to cover expenses, the HSAP only allows withdrawals if the balance is above the threshold and only allows 45 percent of insurance rebates to be refunded in any given year. The HSAP helps resolve this conflict in policy objectives by creating a line of credit that allows households to pay large medical expenses should they occur while still providing significant withdrawals, which gives households an incentive to control expenses or shop around.

Shopping around could be very important component of this proposal given that medical prices in the U.S. can vary significantly for the same procedure. For example, in 2015 the 95th percentile paid $57,225 for a hip replacement while the median cost was only $29,067 and the 25th percentile only paid $18,810 (IFHP, 2015). Because of these cost differences, it is the view of this author that the rewards from creating stronger incentives to control cost outweigh the benefits of a larger HSAP balance. Under the HSAP even households that dip into the insurance rebate portion of their HSAP have a strong incentive to control costs because while any medical expenditure reduces withdrawals in the current year by 45 percent, it also affects withdrawals in subsequent years since the HSAP balance is reduced. Therefore, the cumulative effect over an extended period of years for any money spent (or saved) is almost the full expenditure: 45 percent the first year, nearly 70 percent after two years, 83 percent after three years, 90 percent after four years and 95 percent after five years.

These cash withdrawals, or inability to make withdrawals, matter to households because they could have been used for any purpose, not just some future medical expense, giving households the incentive to control costs. Taken together, this "withdrawability" should create a powerful incentive for households to control costs and shop around for lower cost options.

A secondary benefit of “withdrawability” combined with the flexible deductible is that it potentially reduces the adverse selection problem. Adverse selection in healthcare is an informational asymmetry problem that results from individuals knowing their own health status better than insurance companies. Unable to distinguish between healthier and less healthy consumers or prohibited by law from doing so, insurers may charge rates that cause healthier, lower risk consumers, to decide that the low probability of benefiting from insurance is not worth the certainty of the cost of insurance premiums. Thus, high-risk consumers remain in the insurance pool, while younger and healthier ones leave the pool. To cover higher expected claims from this riskier pool, insurers may be forced to raise premiums; however, the increased premiums create more incentive for healthy consumers to leave the pool—repeating the cycle. This so called “death spiral” can lead to the complete failure of an insurance market. Employer based plans are able to minimize this adverse selection problem because healthier employees usually decide to obtain coverage because of participation requirements and employer subsides.

However, individuals and smaller employers still suffer the adverse selection problem and simply changing the deductible may not solve the issue. If a healthy household chooses a lower deductible plan, it is paying for benefits it is unlikely to receive. If it chooses a lower premium- higher deductible plan, it loses some potential benefits of insurance and a portion of its tax benefit from not being able to write off as much for insurance premiums. As deductibles increase, the tax the household has to pay increases. If insurers try to respond to the adverse selection problem by only offering higher deductible plans, the unhealthy still purchase since they know they will receive benefits while the reduced potential benefits discourage healthier consumers from purchasing; thus continuing the adverse selection problem.

Under this proposal, the adverse selection is minimized. Assuming health insurance premiums are tax deductible and the insurance rebates are not taxed, healthy individuals will willingly pay the premiums for coverage to save on taxes knowing that, they will have low medical expenses and can expect to receive a substantial portion of their premiums back through cash withdraws and insurance rebates. Yes a portion of their premiums are used to pay for claims from unhealthier consumers; however, as long as the tax benefit is greater than this loss, healthy households will be better off because they can shield a portion of their income from taxes. Yet they will still want to control their expenses because they want to withdraw funds from their HSAP for their own purposes. With this incentive for healthy households to purchase health insurance, the problem of adverse selection is reduced.

4. MODEL

Any insurance reform in the U.S. needs to work within the existing insurance system, at least initially, to ease the transition. Since part of the current system is that insurance covers families and not individuals; it is therefore the distribution of family expenditures, not individual expenditures that matter. The challenge is that while data for the probability of individuals suffering a certain medical expense is available, data for the potential distributional impact of these medical expenses on families made up of these individuals is

not. To model this impact, a Monte Carlo analysis is performed using the probabilities of individual medical expenses for age and sex combined with the current composition of household income and the most common household compositions in the United States. The Monte Carlo analysis then seeks to determine the proportion each family pays directly using their HSAP.

5. DATA

Data for this paper were obtained from the 2014 Medical Expenditure Panel Survey (MEPS). This survey of over 30,000 individuals in over 10,000 households contains information regarding each participant's age, sex, household income, medical expenditures, and insured status of household members. The dataset also includes estimations of the total U.S. population represented by each household. To estimate the costs of medical expenses, I first divided the dataset into five categories by age and sex: 26 and under both sexes, 27-45 male, 27-45 female, 46-64 male and 46-64 female. The population was divided by sex since there are significant gender differences in medical expenditures. The 26 and under population was not divided since cost differences between sexes at this age are small and because these groups are currently covered as a group under their parent's health coverage. The age divisions were based upon the fact that costs increase substantially once a person enters his/her mid to late 40s. The age of 45 was selected so both of the adult age groups would consist of 18 year periods.

Using the distribution of medical expenses from the MEPS database for 2014 for each of these five groups, the distribution of medical expenses for each group was calculated. From this data, expenses were arranged into 46 different expenditure ranges: typically in $500 increments for expenditures less than $10,000; then in $2500, $5000, and $25,000 increments for larger expenditures. I calculated the probability of individuals having expenses in each range from the MEPS dataset based upon their age and gender. The probabilities of these expenditures combined with the associated mean expenses was then used to create an empirical dataset of probabilities and medical expenses that the Monte Carlo software would use for its simulations to project household medical expenditures for various household compositions and incomes.

Since health insurance is usually sold on a family (rather than an individual basis), the data were organized by various household compositions based upon these age and sex divisions. The 16 most common household compositions, based on the age and sex of the household members and number of children, were selected. For each household composition type a model was constructed. For each of these

compositions, I then used the probabilities of individual health expenditures appropriate for each member of the household. For example, in a household consisting of a 27-45 year old male, a 27-45 year old female and two dependents under age 27, there would be one expense based upon the probability and expenditure data for a 25-45 year old male, one expense based upon the probability and expenditure data for a 27-45 year old female, and two separate expenses based upon the probability and expenditure data for the two dependents 26 and under. Two separate expenses are required for the dependents since each dependent could have a different amount of medical expenditures. The Monte Carlo software then draws a random outcome based upon the programmed probabilities for each family member.

Based upon these values, and the HSAP program described above, the HSAP account balances over a 15 year period were calculated based upon 1000 random iterations of possible outcomes for each household. From these outcomes, the household's use of its HSAP and the proportion of households utilizing insurance were calculated.

For the insured, the amount of the insurance rebates was calculated as the expected value of claims the insurance company avoids by the households using their HSAP assuming that insured households currently have a $2500 deductible. To determine this, the marginal expenditures that occur in each expenditure range were determined. For example, if a household had a $32,000 medical expense, only $2,000 of this expenditure would occur in the $30,000 to $35,000 group, $2,500 in the $27,500 to $30,000 group, etc. From this information, the expected value of expenditures in each expenditure range was determined based upon the probability of expenditures in that range. This process was repeated for various household compositions.

These values were then used to calculate the expected amount that insurance companies would save by not having to cover expenses in that expenditure range, because the household's HSAP was being utilized instead. These rebate amounts were adjusted assuming households currently had a deductible of $2500. The savings represent the actuarially fair amount insurance companies save by households paying more of their expenses out of their HSAP. For example, suppose a 27-45 year old couple with 2 children had income of $40,000. Their tax rebate would be $1500 per adult and $500 per child for a total of $4,000. They would be expected to contribute $2000 and they would have a credit line of $18,000. This would provide an HSAP balance of $24,000. As shown in Table 2, this household would receive at least $5,812 in insurance rebates that would be added to its HSAP account at the end of the year.

Table 2: Example Yearly Insurance Rebate Family of Four

HSAP Balance	*Expected Value within Range*	Proportion of Expenses Greater Than	*Rebate*
$2500	$332.15	0.694	$332
3000	304.94	0.633	637
3500	282.58	0.589	920
4000	261.76	0.543	1,181
4500	249.86	0.509	1,431
5000	236.68	0.488	1,668
5500	225.86	0.461	1,894
6000	216.53	0.440	2,110
6500	209.48	0.425	2,320
7000	203.40	0.415	2,523
7500	193.05	0.400	2,716
8000	178.28	0.370	2,895
8500	165.38	0.343	3,060
9000	154.31	0.314	3,214
9500	149.55	0.303	3,364
10000	661.30	0.294	4,025
12500	510.03	0.218	4,535
15000	417.61	0.190	4,953
17500	336.92	0.149	5,290
20000	277.91	0.125	5,568
22500	244.89	0.102	5,812
25000	195.05	0.087	6,008
27500	167.83	0.073	6,175
30000	283.54	0.065	6,459
35000	251.81	0.052	6,711
40000	190.25	0.042	6,901
45000	149.04	0.035	7,050
50000	262.66	0.029	7,313
60000	238.25	0.025	7,551

A sample of an HSAP with medical expenses for a household consisting of a 27-45 year old male and female with two children and household income of $44,000 is shown in the appendix**.** This table calculates the sample household's HSAP balance over a 15 year period. The example medical expenses were drawn from one of the Monte Carlo iterations. This particular iteration value was chosen because unlike most iteration values where the household never had to utilize insurance, this household iteration shows the impact of a large medical expense on the account balance and how the household would utilize insurance. Other scenarios are available upon request to the author.

6. Results

The risks to the insured household under the HSAP are minimal. Only 3 percent of households in the Monte Carol simulations were worse off than with traditional high deductible insurance; however, given the flexible deductible, the potential loss is capped at their 5 percent contribution and the potential rewards from the payroll tax rebates and insurance savings are substantial. In fact, the simulations showed that for a young couple with two children, 93 percent of households increased their wealth by more than $10,000, 80 percent by more than $35,000, and more than half of households gained $60,000 in wealth over a 15 year period.

Using the process described above and repeating for each household composition with 1000 iterations each, the Monte Carlo simulations were able to determine HSAP use and whether each household used insurance. The portion of households using insurance during each year was calculated and averaged over the 15 year period. These results are shown in Table 3. For sake of brevity, the 27-45 age group is referred to as ‘younger’, the 46-64 age group as ‘older’, and 26 and under group as ‘children’ unless living independently.

These results show that annual insurance utilization among the currently insured is drastically reduced. In eleven of the sixteen household compositions tested fewer than 10 percent of households, on average, over the 15 year period modeled utilized insurance for their medical needs. The following households slightly exceeded the 10 percent insurance use: older couple households with no children, older couple households with two children, older female one child households, and younger female two children households with 10.3, 10.2, 11.1 and 12.7 percent utilization respectively. Only couples with four children significantly exceeded the 10 percent figure with 24.1 percent utilization. Taking the weighted average of insurance use, only 8.1 percent of insured households utilized insurance payments. This compares to the 60 percent utilization using the same method but utilizing traditional insurance with $2500 family deductibles and $1500 individual deductibles. This figure is less than the 80 percent estimated by Fronstin (2013) however many high deductible plans have deductibles far lower than the

Table 3: Results for Various Household Compositions and Calculation of Health Insurance Use

Household Composition	All under 65	Uninsured	Insured	Uninsured, Income greater than $15k	Insured, Income greater than 15K	Expected Value of Insurance Claims (15K deductible above HSAP)	Percent Uninsured Paying More than HSAP	All under 65, Income $15K or above	Percent Households, insured, Making Claim under Proposal	Percent Households with Some Insurance Making Claim (Current)
Older Couple No Children	9,649,152	2,515,034	7,134,118	2,385,364	6,728,759	$ 2,953	19.4%	9,114,124	10.3%	73.7%
Single Older Female	9,579,946	2,223,675	7,356,271	1,696,747	5,968,272	$ 1,804	15.4%	7,665,019	8.8%	70.4%
Single Older Male	8,231,719	2,066,850	6,164,869	1,552,182	4,938,031	$ 3,365	11.3%	6,490,213	8.1%	50.0%
Young Couple Two Children	6,682,139	2,096,384	4,585,755	2,039,374	4,463,104	$ 3,333	15.2%	6,502,478	6.4%	69.4%
Single Young Male	6,228,660	1,381,426	4,847,234	1,181,985	4,228,764	$ 188	3.8%	5,410,749	3.1%	25.5%
Older Couple One Child	4,437,881	1,108,832	3,329,049	1,090,033	3,187,218	$ 2,103	23.2%	4,277,250	9.0%	78.0%
Young Couple One Child	4,115,953	1,368,186	2,747,767	1,339,778	2,661,820	$ 1,134	10.5%	4,001,598	4.8%	62.9%
Young Couple No Children	3,890,763	1,259,834	2,630,929	1,213,205	2,553,954	$ 940	7.1%	3,767,159	4.3%	44.5%
Older Couple Two Children	3,681,047	1,073,547	2,607,500	1,054,275	2,552,623	$ 5,199	22.8%	3,606,899	10.2%	82.4%
Young Couple Three Children	3,622,960	829,905	2,793,055	795,323	2,721,414	$ 5,636	26.4%	3,516,736	8.1%	71.2%
Single Young Female	3,380,814	631,988	2,748,826	489,902	2,395,109	$ 456	7.1%	2,885,011	5.0%	53.7%
Couple Four Children	1,979,896	443,879	1,536,017	415,546	1,477,752	$ 1,827	49.1%	1,893,298	24.1%	71.1%
26 and Under Individual	2,834,545	797,811	2,036,733	546,572	1,441,939	$ 244	4.1%	1,988,511	4.2%	13.0%
Older Female One Child	2,532,625	860,392	1,672,233	760,915	1,315,519	$ 1,172	21.6%	2,076,434	11.1%	61.2%
Younger Female Two Children	1,920,922	640,091	1,280,831	510,130	1,036,568	$ 979	22.3%	1,546,698	12.7%	55.3%
Younger Female One Child	2,033,630	589,974	1,443,657	428,058	1,222,465	$ 375	13.3%	1,650,523	9.1%	41.1%
Other Household Combinations	27,007,848	7,837,468	19,170,381	7,123,223	17,425,747			24,548,970		
Total Households	**102 Million**	**28 Million**	**74 Million**	**25 Million**	**66 Million**	**$ 2,282**	**15.9%**	**91 Million**	**8.1%**	**60.4%**

deductibles used in these estimations and so these actually may understate the percentage of transactions utilizing insurance.

These results indicate that adopting the HSAP could drastically reduce insurance usage and therefore reduce the associated administrative expenses. For uninsured households under the same program, the need to utilize either their own funds beyond their 5 percent contribution or government aid such as Medicaid was relatively small at only an average of 15.9 percent of households. In fact, using data regarding Medicaid participant income and distribution of medical expenses from the 2014 MEPS, the number of non-elderly households using Medicaid would be reduced from 45 million households to fewer than 7 million households without even these household borrowing from their line of credit; an 82 percent reduction in households using Medicaid. It was also found that this would reduce Medicaid expenditures by 53 percent.

Therefore, under this HSAP, even uninsured households would only utilize third party payments less than 16 percent of the time. Combined with the only 8.1 percent of insured households that would utilize their insurance, this means that only 10.1 percent of households in the United States would utilize third party payments of any kind. This is a significant reduction from the 45 million households currently receiving Medicaid and the 60-80 percent of insured households utilizing insurance; this means that currently 83 percent of households utilize third party payments. To reduce this to only 10.1 percent of household means that almost 90 percent of households directly pay for all their own medical expenses. The MEPS dataset shows that this would reduce third-party payments to 40 percent of all expenditures. This shows that HSAs could produce Singapore levels of direct payments in the U.S. even with our higher use of medical care and higher medical prices. Next, we must determine whether the cost of this program is feasible.

6.1 COST OF PROGRAM

This program does not repeal the Affordable Care Act's (ACA) Medicaid expansion or ACA health insurance marketplace provisions; however, government expenditures on these programs would be reduced by households utilizing HSAP accounts rather these programs. Households participating in the ACA exchanges and not receiving subsidies would be eligible for the HSAP subsidies, while those receiving subsidies would be ineligible. The only cost to the government of this program is the payroll tax rebates. These tax rebates would only be available to households who have earnings greater than $15,000, the equivalent of one full time worker in a household earning minimum wage. Those below this amount would still be covered under the current Medicaid system. In 2014, these rebates would have been $309 Billion or 1.7 percent of GDP; however, this cost would be partially offset by a $144 Billion reduction in

governmental expenditures: $119 Billion in savings from households utilizing HSAP rather than Medicaid and an estimated $25 billion in fraud reduction. Additional savings would be realized if the HSAP reduced management expenses or fostered greater competition. Based on the MEPS dataset, a 10 percent reduction in medical expenses would save non-elderly households $100 Billion, the government $50 billion in Medicaid expenditures and potentially much more if improved healthcare efficiency slows the growth of Medicare expenditures. The government could also raise revenue to pay for this program by adjusting health insurance tax deduction rules. These deductions currently reduce tax revenue by $275 Billion. (CBO, 2016)

The estimates of the cost savings are based on the 2014 MEPS dataset that shows that households with incomes greater than $15,000 accounted for $175 Billion in Medicaid Expenditures. Using the HSAP, Medicaid expenditures by this group would have been reduced to $82 Billion; a savings of $93 Billion annually; however, this does not include the full savings of the HSAP because Medicaid spending increased since 2014 with the expanded ACA eligibility; increasing expenditures by nearly $80 Billion (CBO, 2017). To estimate the potential savings in this group, the MEPS dataset was used to estimate medical expenditures for those 138 percent below the poverty line made eligible by the ACA for Medicaid who would receive HSAP subside. The HSAP enabled households to pay 32 percent of their medical expenditures. A 32 percent savings from the additional $80 Billion spent on the expanded eligibility group would result in an additional $26 Billion in annual savings.

Finally, as discussed earlier in the paper, fraud accounts for 5-10 percent of medical expenditures. Medicaid expenditures alone are over $500 billion and private non-elderly expenditures exceed $1 trillion, meaning that fraud costs between $75 Billion and $150 Billion annually, it seems reasonable to project that HSAPs could reduce fraud by a modest $25 billion since there would be fewer third-party transactions subject to fraud.

7. CONCLUSION AND AREAS FOR FUTURE RESEARCH

In this paper, it was shown that it is feasible to create an HSA system enabling Singapore levels of direct payments by U.S. households even though the U.S. has higher medical prices, differing medical use and demographics. The HSA system developed in this paper, the HSAP, through minimal household contributions, tax and insurance rebates and a line of credit effectively enables households to pay directly for more of their care. This not only provides incentives for households to control expenditures and seek out lower cost care, it empowers the household to seek medical care without third-party restrictions. It enables Singapore levels of direct payments by households and reduces insured household's insurance utilization from 80 percent to 8 percent. It also reduces non-elderly Medicaid use from 45 million to fewer than 7 million; and reduces the number of households receiving third-party payments to only 10.1 percent

and third-party medical expenditures to 40 percent. Almost 90 percent of households would directly pay all their medical expenditures.

While this paper shows that a HSA system could be implemented in the U.S. to enable Singapore levels of household direct pay, the Singapore system is much more complex than just HSAs. For example, the government decides how much it will pay for drugs and subsidizes care directly with hospitals. The government therefore also decides how much it will pay for these medical services and how much households must pay. (Liu, 2009) Given these differences and the fact that a small minority of households are responsible for the majority of U.S. medical expenditures, we cannot assume that medical costs in the U.S. will mirror the Singapore experience. The exact financial savings and reduced administrative costs of increasing the levels of direct pay are beyond the scope of this paper, but are an important area for future research. Further analysis could also be performed on whether HSAs create enough competition between providers to significantly lower medical prices for these directly paid services and whether this also reduces the cost of providing extraordinary medical services that may consist of a multitude of these smaller medical services

Another area for potential research is the impact of the flexible deductible described in this paper on the incentive for healthy households to obtain insurance. The results generated in this paper assume that the portion of households with insurance remained constant; however, given the greater rewards for healthy households to purchase health insurance with the HSAP insurance rebates for higher account balances and the potential tax benefits, the percentage of households voluntarily purchasing insurance might increase. Whether or not this would be a large impact is an area for future research.

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APPENDIX

Table 3: Sample Household HSAP Balance through Time: Income = $44,000, 27-45 year old male and female, two children.

Year	HSAP at Beginning of Year (Also Flexible Deductible)	Tax Rebate	Employee Contr.	Employee Contribution and Tax Rebate	Insurance Rebate	HSAP Balance Including Line of Credit Before Medical Expense	Threshold Required	Medical Expense Adult Male	Medical Expense Adult Female	Medical Expense Child 1	Medical Expense Child 2	Total Medical Expenses	Balance after Medical Expenses	Refund of Unused Contribution and Tax Rebate	Balance after return of Unused Contribution and Tax Rebate and Medical Expenses	Balance Above Threshold	Cash Refund of 45% above Threshold	Total Cash Refund	Balance after All Expenses and Refunds	Balance Not Including Line of Credit
1	25,200	4,000	2,200	6,200	6,008	37,408	29,200	-	-	2,238	27	2,265	35,143	3,935	31,208	2,008	903	4,838	30,304	5,104
2	30,304	4,000	2,200	6,200	6,459	42,963	29,200	-	450	27	1,619	2,096	40,867	4,104	36,763	7,563	3,403	7,508	33,360	8,160
3	33,360	4,000	2,200	6,200	6,459	46,019	29,200	23	745	449	1,619	2,836	43,183	3,364	39,819	10,619	4,778	8,142	35,040	9,840
4	35,040	4,000	2,200	6,200	6,711	47,951	29,200	147	-	547	348	1,042	46,909	5,158	41,751	12,551	5,648	10,806	36,103	10,903
5	36,103	4,000	2,200	6,200	6,711	49,014	29,200	147	14,892	7,432	7,432	29,904	19,110	-	19,110	-	-	-	19,110	-
6	19,110	4,000	2,200	6,200	5,290	30,600	29,200	76	2,220	-	2,238	4,534	26,066	-	26,066	-	-	-	26,066	866
7	26,066	4,000	2,200	6,200	6,008	38,273	29,200	-	2,788	-	148	2,936	35,337	3,264	32,073	2,873	1,293	4,557	30,780	5,580
8	30,780	4,000	2,200	6,200	6,459	43,439	29,200	-	645	1,619	1,358	3,622	39,817	2,578	37,239	8,039	3,618	6,196	33,622	8,422
9	33,622	4,000	2,200	6,200	6,459	46,280	29,200	36,838	341	-	250	37,428	12,659	-	12,659	-	-	-	12,659	-
10	12,659	4,000	2,200	6,200	4,535	23,394	29,200	-	1,878	547	148	2,573	20,821	-	20,821	-	-	-	20,821	-
11	20,821	4,000	2,200	6,200	5,568	32,588	29,200	651	341	-	2,238	3,230	29,358	158	29,200	-	-	158	29,200	4,000
12	29,200	4,000	2,200	6,200	6,175	41,575	29,200	4,236	5,354	-	148	9,738	31,838	-	31,838	2,638	1,187	1,187	30,651	5,451
13	30,651	4,000	2,200	6,200	6,459	43,310	29,200	651	246	844	1,358	3,099	40,210	3,101	37,110	7,910	3,559	6,660	33,550	8,350
14	33,550	4,000	2,200	6,200	6,459	46,209	29,200	2,767	3,250	348	2,740	9,106	37,104	-	37,104	7,904	3,557	3,557	33,547	8,347
15	33,547	4,000	2,200	6,200	6,459	46,206	29,200	-	-	753	3,734	4,487	41,719	1,713	40,006	10,806	4,863	6,576	35,143	9,943

REFEREES

1. Paul Bauer
2. James Booker
3. Fan Chen
4. Kai Chen
5. Robert Jones
6. James Murtagh
7. Philip Sirianni
8. David Vitt
9. Jeffrey Wagner
10. Mark Zaparowski
11. Xu Zhang

The New York State Economics Association

69th Annual Conference
Farmingdale State College
October 7 & 8, 2016

Schedule of Events

Friday, October 7, 2016

6:30 pm	Reception, Hilton Long Island/Huntington Hotel, Melville, NY
6:45 pm	Welcome

Saturday October 8, 2016

7:30 am - 8:00 am	Registration and Continental Breakfast (Campus Center Ballroom)
8:00 am – 8:15 am	Welcome
8:15 am – 9:35 am	Concurrent Sessions: Group A (Business Building)
9:35 am – 9:50 am	Morning Break

9:50 am – 11:10 am	Concurrent Sessions: Group B (Business Building)
11:25 am – 12:50 pm	Luncheon and Keynote Address: Dr. Solomon Polachek (Binghamton University and IZA) (Campus Center Ballroom)
1:00 pm – 2:20 pm	Concurrent Sessions: Group C (Business Building)
2:20 pm – 2:35 pm	Afternoon Break
2:35 pm – 3:55 pm	Concurrent Sessions: Group D (Business Building)
4:00 pm - 5:00pm	Business Meeting (All Are Welcome) Business Building 124

Saturday, October 8, 2016

7:30-8:00 am REGISTRATION AND CONTINENTAL BREAKFAST

Campus Center Ballroom, Farmingdale State College

8:00-8:15 am WELCOME ADDRESS

8:15 - 9:35AM: Concurrent Sessions: Group A

Session A1 **Health, Education and Welfare**
8:15 to 9:35 am, Business Building 215

Chair: Juan Jaramillo (Farmingdale State College), jaramijr@farmingdale.edu

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Title: Breast Cancer and Employment Among Working-Age Women in the US
Authors: Shannon Pullaro (Fordham University), spullaro@fordham.edu
Sophie Mitra (Fordham University), mitra@fordham.edu

Discussant: Meiping (Aggie) Sun (Columbia University), ms4196@columbia.edu

Title: The Effects of Local Liquor Sales Restriction on Birth Outcomes
Authors: Meiping (Aggie) Sun (Columbia University), ms4196@columbia.edu
Discussant: ~~Ambrose Jusu (Farmingdale State College), jusua@farmingdale.edu~~

Title: State Health Care Efficiencies: A Comparison Using Data Envelopment Analysis

Author: Juan Jaramillo (Farmingdale State College), jaramijr@farmingdale.edu
Discussant: Shannon Pullaro (Fordham University), spullaro@fordham.edu

Session A2 Law and Economics
8:15 to 9:35 am, Business Building 218

Chair: Mary Catherine Arnold-Clifford (Farmingdale State College), cliffom@farmingdale.edu

---

Title: Exploring Inefficiencies in the U.S. Legal System
Authors: Anthony Papas (St. John's University), anthonypappas1988@gmail.com

Discussant: Mary Catherine Arnold-Clifford (Farmingdale State College), cliffom@farmingdale.edu

Title: Going to Pot – Operating a Marijuana Business and Navigating the Law is No Easy Task in Colorado
Author: Mary Catherine Arnold-Clifford (Farmingdale State College), cliffom@farmingdale.edu
Discussant: Veronica Santana-Frosen (Ithaca College), vsantanafrosen@ithaca.edu

Title: Tiny Houses, Big Concerns: The Tiny House Phenomenon
Author: Gwen Seaquist (Ithaca College),
Alka Bramhandkar (Ithaca College),
Veronica Santana-Frosen (Ithaca College), vsantanafrosen@ithaca.edu
Discussant: Alexander Brehm (University of Oxford), alexander.brehm@linacre.ox.ac.uk

Title: "Because It's 2015": Quotas, Race, and Correcting Gender Bias in Boards and Cabinets
Author: Alexander Brehm (University of Oxford), alexander.brehm@linacre.ox.ac.uk
Discussant: Anthony Papas (St. John's University), anthonypappas1988@gmail.com

Session A3 Labor and Demographic Economics
8:15 to 9:35 am, Business Building 221

Chair: Yaojing Wang (Farmingdale State College), wangy1@farmingdale.edu

---

Title: Sun Yat-sen's Theory on "Happiness Economics"
Author: Hongchun Fu (East China Normal University), hcfu@jjx.ecnu.edu.cn
Discussant: Katie Jajtner (Fordam University), kjajtner@fordham.edu

Title: Intergenerational Economic Mobility and Disability
Authors: Katie Jajtner (Fordam University), kjajtner@fordham.edu

Discussant: Bo Li (Stony Brook University), bo.li.3@stonybrook.edu

Title: Macroeconomic Effects of Talent Misallocation in the Great Recession
Authors: Bo Li (Stony Brook University), bo.li.3@stonybrook.edu
Discussant: Yaojing Wang (Farmingdale State College), wangy1@farmingdale.edu

Title: Peer Quality and the Academic Benefits to Attending Better Schools
Author: Mark Hoekstra (Texas A&M University)
Pierre Mouganie (American University of Beirut)
Yaojing Wang (Farmingdale State College), wangy1@farmingdale.edu
Discussant: Hongchun Fu (East China Normal University), hcfu@jjx.ecnu.edu.cn

Session A4 Microeconomics
8:15 to 9:35 am, Business Building 315

Chair: Estefania Vergara-Cobos (Stony Brook University), estefania.vergarcobos@stonybrook.edu

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Title: Understanding Regulation and Market Disruption via an Agent Based Model of the Taxi Market
Author: Estefania Vergara-Cobos (Stony Brook University), estefania.vergarcobos@stonybrook.edu
Discussant: Hyeon Park (Manhattan College), hyeon.park@manhattan.edu

Title: Loss Aversion, Borrowing Constraints and Stochastic Reference Points
Author: Hyeon Park (Manhattan College), hyeon.park@manhattan.edu
Discussant: Jay K. Walker (Niagara University), jwalker@niagara.edu

Title: A Cross Country Analysis of Religious Belief, Corruption, and Economic Freedom
Author: Michael Jetter (University of Western Australia)
Allyssa A. Wadsworth (Niagara University)
Jay K. Walker (Niagara University), jwalker@niagara.edu
Discussant: David Vitt (Farmingdale State College), dcvitt@gmail.com

Title: Auction Fever: Evidence of Questionably Rational Bidding Behavior and Liquidity Preferences
Author: David Vitt (Farmingdale State College), dcvitt@gmail.com
Discussant: Estefania Vergara-Cobos (Stony Brook University), estefania.vergarcobos@stonybrook.edu

Session A0 **Undergraduate Student Paper Contest: A**
8:15 to 9:35 am, Business Building 321

Chair: Della L. Sue (Marist College), della.lee.sue@marist.edu

---

Title: Corporate Sustainability and Business Performance Using the Dow Jones Sustainability Index
Author: Oliver Hollingsaeter (Long Island University), oliver.hollingsaeter@my.liu.edu
Discussant: Jeffrey Wagner (Rochester Institute of Technology) mjwgse@rit.edu

Title: Halo Effect: Stock Returns to Firms with Closely Matching Tickers as IPOs
Author: Vijay Kadiyala (Williams College), vijaykadiyala@hotmail.com
Discussant: William P. O'Dea (SUNY Oneonta), odeawp@oneonta.edu

Title: Impact of Minimum Wage on Labor Welfare under Different Levels of Competition
Author: Hengde Ding; Yizhou Wang; Hongjin Huang (University of California--LA), hengdeding@ucla.edu
Discussant: Jeffrey Wagner (Rochester Institute of Technology) mjwgse@rit.edu

Title: The Relationship between the Stock Market and the Exchange Rate in Financial Crisis
Author: Eric Jin (Farmingdale State College), jinx@farmingdale.edu
Discussant: Kpoti Kitissou (SUNY Oswego), kpoti.kitissou@oswego.edu

9:50 - 11:10AM: Concurrent Sessions: Group B

Session B1 **Financial Economics**
9:50 to 11:10 am, Business Building 215

Chair: Chunhui Yu, (Farmingdale State College), Chunhui.yu@farmingdale.edu

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Title: Liquidity and Stock Returns on China's New Third Board Market
Authors: Zhaohui Zhang, (Long Island University Post), zhaohui.zhang@liu.edu
Discussant: Katarzyna, Platt (SUNY College at Old Wesbury), plattk@oldwestbury.edu

Title: Information Transfer Effect and Leverage
Author: Katarzyna, Platt (SUNY College at Old Wesbury), plattk@oldwestbury.edu
Discussant: Biwei Chen (CUNY Graduate Center), bchen@gradcenter.cuny.edu

Title: Shortfall Risk in Long Term Hedging with Short-term Future Contracts on Multi-Commodity Case

Author: Chunhui Yu, (Farmingdale State College), Chunhui.yu@farmingdale.edu
Carynne Litcher, (Farmingdale State College)
Discussant: Vipul K. Bansal (St. John's University), bansalv@stjohns.edu

Title: Hedge Fund Performance and Investment Styles
Author: Kaushal Shah (St. John's University)
Vipul K. Bansal (St. John's University), bansalv@stjohns.edu
Discussant: Zhaohui Zhang, (Long Island University Post), zhaohui.zhang@liu.edu

Title: A Markov Chain Approach to Modeling the Term Structure of Interest Rates
Authors: Biwei Chen (CUNY Graduate Center), bchen@gradcenter.cuny.edu
Discussant: Chunhui Yu, (Farmingdale State College), Chunhui.yu@farmingdale.edu

Session B2 Economic Growth and Productivity
9:50 to 11:10 am, Business Building 218

Chair: James F. Booker (Siena College), jbooker@siena.edu

Title: Do U.S. Government Expenditures and Tax Revenues Respond to Debt Levels and Economic Conditions Asymmetrically over the Business Cycle?

Authors: Hedieh Shadmani (Fairfield University), hshadmani@fairfield.edu
Steven P. Cassou (Kansas State University)
Discussant: James F. Booker (Siena College), jbooker@siena.edu

Title: Single Factor Productivity Theory and Policy
Author: James F. Booker (Siena College), jbooker@siena.edu
Imeshi Weerasinghe (Vrjie Universiteit Brussel and Katholieke Universiteit Leuven)
Discussant: Karine Gente (Aix Marseille University), karine.gente@univ-amu.fr

Title: Undervaluation, Social Optimum and Growth
Author: Karine Gente (Aix Marseille University), karine.gente@univ-amu.fr
Discussant: Joseph Mauro (Fordham University), jmauro6@fordham.edu

Title: Examing the Role of Education Finance on Economic Growth and Intergenerational Income Mobility
Authors: Joseph Mauro (Fordham University), jmauro6@fordham.edu
Discussant: Hedieh Shadmani (Fairfield University), hshadmani@fairfield.edu

Session B3 Sports Economics
9:50 to 11:10 am, Business Building 221

Chair: Michael McAvoy (SUNY Oneonta), michael.mcavoy@oneonta.edu

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Title: Winning, Effort and Incentives in ATP Tennis
Author: Darius Conger (Elmira College), dconger@htva.net
Discussant: Michael McAvoy (SUNY Oneonta), michael.mcavoy@oneonta.edu

Title: Collector Discrimination in Hall-of-Fame Player Baseball Cards
Author: Michael McAvoy (SUNY Oneonta), michael.mcavoy@oneonta.edu
Discussant: Emese Ivan (St. John's University), ivane@stjohns.edu

Title: Leading by Acting: Financing Soccer in Post-Communist Countries
Author: Emese Ivan (St. John's University), ivane@stjohns.edu
Discussant: Michael Fraina (Farmingdale State College), fraina.1@osu.edu

Title: A Model for Improved Sport Programming in Underprivileged Communities
Authors: Michael Fraina (Farmingdale State College), fraina.1@osu.edu
Discussant: Darius Conger (Elmira College), dconger@htva.net

Session B4 International Economics
9:50 to 11:10 am, Business Building 315

Chair: Clair Smith **(**St. John Fisher College), csmith@sjfc.edu

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Title: Inequalities and Real Exchange Rates
Author: Carine Nourry (Aix Marseille University), carine.nourry@univ-amu.fr
Discussant: Dene Hurley (Lehman College, CUNY), Dene.Hurley@lehman.cuny.edu

Title: The Relationship between the Trade Balance and Exchange Rate Changes: The China-U.S. Case
Authors: Dene Hurley (Lehman College, CUNY), Dene.Hurley@lehman.cuny.edu
Nikolaos Papanikolaou (Lehman College, CUNY)
Discussant: Dan Yang (MUC University of China), ydyd333@gmail.com

Title: Risk Allocation in China's Public-Private Partnership
Author: Dan Yang (MUC University of China), ydyd333@gmail.com
Discussant: Walter Bazán-Palomino (Fordham University), wbazanpalomino@fordham.edu

Title: The New Keynesian Framework for a Small Open Economy with Structural Breaks: Empirical Evidence from Peru
Author: Walter Bazán-Palomino (Fordham University), wbazanpalomino@fordham.edu
Gabriel Rodriguez (Pontificia Universidad Católica Del Perú)
Discussant: Carine Nourry (Aix Marseille University), carine.nourry@univ-amu.fr

Session B5 **Accreditation and Curricular Issues in Business Management (Panel Discussion)**
9:50 to 11:10 am, Business Building 115

Chair: Nanda Viswanathan (Farmingdale State College), nanda.viswanathan@farmingdale.edu

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Panelist: Nanda Viswanathan (Farmingdale State College), nanda.viswanathan@farmingdale.edu
Martin Lewison (Farmingdale State College), lewisom@farmingdale.edu
Kristin Sotak (Farmingdale State College), sotakkl@farmingdale.edu
Areeg Barakat (Farmingdale State College), barakaai@farmingdale.edu
Juan Jaramillo (Farmingdale State College), jaramijr@farmingdale.edu

Session B0 **Undergraduate Student Paper Contest: B**
9:50 to 11:10 am, Business Building 321 (Reserved for Committee Meeting)

11:25 - 12:50 pm Luncheon and Keynote Address (Campus Center Ballroom)

1:00 - 2:20PM: Concurrent Sessions: Group C

Session C1 **General Economics and Teaching**
1:00 to 2:20 pm, Business Building 215

Chair: Della L. Sue (Marist College), della.lee.sue@marist.edu

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Title: The Effect of Prerequisite Courses on a Student's Performance in Econometrics
Author: Della L. Sue (Marist College), della.lee.sue@marist.edu
Discussant: Jay K. Walker (Niagara University), jaykody@hotmail.com

Title: College Internships and Student Outcomes: A Multiple-Treatment Matching Approach

Author: P. Wesley Routon (Georgia Gwinnett College)
Jay K. Walker (Niagara University), jaykody@hotmail.com
Discussant: Cristian Sepulveda (Farmingdale State College), cristian.sepulveda@farmingdale.edu

Title: Determinants of Students' Performance in Principles of Economics: The Case of a Commuting Technical Colleges
Author: Abeba Mussa (Farmingdale State College), mussaa@farmingdale.edu
Cristian Sepulveda (Farmingdale State College), cristian.sepulveda@farmingdale.edu
Discussant: Ikwueze Chukwudi (Queensborough Community College-CUNY), chuikwueze@aol.com

Title: Are College Instructors Achieving Learning Objectives in Economics Classes
Authors: Ikwueze Chukwudi (Queensborough Community College-CUNY), chuikwueze@aol.com
Discussant: Clair Smith (St. John Fisher College), csmith@sjfc.edu

Title: Student Note-Taking and Substantive Performance in Economics Principles Classes Redux
Authors: Lauren Calimeris (St. John Fisher College)
Clair Smith (St. John Fisher College), csmith@sjfc.edu
Discussant: Della L. Sue (Marist College), della.lee.sue@marist.edu

Session C2 Environmental and Agricultural Economics
1:00 to 2:20 pm, Business Building 218

Chair: Jeffrey Wagner (Rochester Institute of Technology) mjwgse@rit.edu

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Title: Evolution and Future Prospects for U.S- Cuba Agricultural Trade: Implications for New York State
Author: Mario A. González-Corzo (Lehman College, CUNY), mario.gonzalez-corzo@lehman.cuny.edu
Discussant: Richard Vogel (Farmingdale State College), richard.vogel@farmingdale.edu

Title: The Economic Impacts of Recreational Fishing and Coastal Tourism in Long Island: A Computable General Equilibrium Analysis
Authors: Sheng Li (Farmingdale State College), lis@farmingdale.edu
Richard Vogel (Farmingdale State College), richard.vogel@farmingdale.edu
Nanda Viswanathan (Farmingdale State College), nanda.viswanathan@farmingdale.edu
Discussant: Jeffrey Wagner (Rochester Institute of Technology), mjwgse@rit.edu

Title: Incentivizing Landfill Product Aftermarkets for Sustainable Waste Management
Authors: Max Schreck
Jeffrey Wagner (Rochester Institute of Technology), mjwgse@rit.edu
Discussant: Worku T. Bitew (Farmingdale State College), biteww@farmingdale.edu

Title: Bio-economic Model of Externalities in Aquaculture Production in Developing Countries
Author: Worku T. Bitew (Farmingdale State College), biteww@farmingdale.edu
Wisdom Akpalu (United Nations University-WIDER), akpalu@wider.unu.edu
Discussant: Mario A. González-Corzo (Lehman College, CUNY), mario.gonzalez-corzo@lehman.cuny.edu

Session C3 Investments, Bonds and Interest Rates
1:00 to 2:20 pm, Business Building 315

Chair: Robert Culp (Dalton State College), rculp@daltonstate.edu

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Title: The Effects of Eurobonds
Authors: Vasileios Tsiropoulos (Stony Brook University), bill_tsiropoulos@hotmail.com
Discussant: Vipul K. Bansal (St. John's University), bansalv@stjohns.edu

Title: Intertemporal Changes in Reverse Mortgages
Author: Vipul K. Bansal (St. John's University), bansalv@stjohns.edu
M.E. Ellis (St. John's University)
Discussant: Jinyong Lu, (University of International Business and Economics, China)

Title: How Does the New Changes in International Investment Rules Affect Outward FDI of Chinese Enterprises?
Authors: Jinyong Lu, (University of International Business and Economics, China)
Yu Chen, (Farmingdale State College), viviennechen26@gmail.com
Guang Wang,(University of International Business and Economics, China)
Discussant: Robert Culp (Dalton State College), rculp@daltonstate.edu

Title: Low Interest Rates and Constrained Leverage Opportunities: How Low Interest Rate Policies Could Cause Investment Misallocation
Author: Robert Culp (Dalton State College), rculp@daltonstate.edu
Discussant: Vasileios Tsiropoulos (Stony Brook University), bill_tsiropoulos@hotmail.com

Session C4 Business
1:00 to 2:20 pm, Business Building 221

Chair: Rick Weber (Farmingdale State College), weberr@farmingdale.edu

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Title: "We Should Have Seen This Coming: A Re-evaluation of Convergenc
Authors: Harvey Heinowitz (Adelphi University), heinowit@adelphi.edu
Discussant: Rick Weber (Farmingdale State College), weberr@farmingdale.edu

Title: Economic Complexity in the United States
Author: Rick Weber (Farmingdale State College), weberr@farmingdale.edu
Discussant: Carol Connell (Brooklyn College-CUNY),CConnell@brooklyn.cuny.edu

Title: Strategy and Management Theory on Crisis
Authors: Carol Connell (Brooklyn College-CUNY),CConnell@brooklyn.cuny.edu
Discussant: Jing Feng (Farmingdale State College), fengj@farmingdale.edu

Session C5 Health, Education and Welfare
1:00 to 2:20 pm, Business Building 321

Chair: Wade Thomas (SUNY Oneonta), Wade.Thomas@oneonta.edu

Title: Unpacking Wage Inequality in the United States
Authors: Gowun Park (CUNY Graduate Center), gpark@gradcenter.cuny.edu
Discussant: Kyle A. Kelly (West Chester University), kkelly2@wcupa.edu

Title: The Impact of Economic Conditions on the Rate of Return to Schooling
Author: Yanan Chen (West Chester University),
Kyle A. Kelly (West Chester University), kkelly2@wcupa.edu
Discussant: Raul Segura-Escano (CUNY Graduate Center), rsegura@gradcenter.cuny.edu

Title: The Impact of Terrorism on Mental Health and Substance Use: Evidence from the Boston Marathon Bompings
Author: Michael F. Pesko (Cornell University), mip2037@med.cornell.edu
Raul Segura-Escano (CUNY Graduate Center), rsegura@gradcenter.cuny.edu
Discussant: Isai Paredones Araque (Siena College), ia10pare@siena.edu

Title: Construction of Cost of Living Index and Use It to Find Relative Minimum Wage for all States
Author: Manimoy Paul (Siena College), mpaul@siena.edu
Isai Paredones Araque (Siena College), ia10pare@siena.edu
Discussant: Gowun Park (CUNY Graduate Center), gpark@gradcenter.cuny.edu

2:35 – 3:55 pm: Concurrent Sessions: Group D

Session D1 Urban and Regional Economics
2:35 to 3:55 pm, Business Building 215

Chair: Abeba Mussa (Farmingdale State College), mussaa@farmingdale.edu

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Title: How Municipalities Managed the Crisis: Empirical Evidence for the Largest One Hundred Municipalities from 2006 - 2015
Authors: Diane Coogan-Pushner (Queens College, CUNY), diane.cooganpushner@qc.cuny.edu
Discussant: Abeba Mussa (Farmingdale State College), mussaa@farmingdale.edu

Title: Birthplace Diversity and Economic Growth: Evidence from the U.S. States
Authors: Abeba Mussa (Farmingdale State College), mussaa@farmingdale.edu
Cristian Sepulveda (Farmingdale State College), cristian.sepulveda@farmingdale.edu
Discussant: Sean MacDonald (New York City College of Technology – CUNY), smacdonald@citytech.cuny.edu

Title: Has the Uneven Rebound Following the Great Recession Contributed to a Disparate U.S. Housing Market Recovery?
Author: Sean MacDonald (New York City College of Technology – CUNY), smacdonald@citytech.cuny.edu
Discussant: Diane Coogan-Pushner (Queens College, CUNY), diane.cooganpushner@qc.cuny.edu

Session D2 Teaching Sports Economics for Sports Management Major (Panel Discussion)
2:35 to 3:55 pm, Business Building 218

Chair: Glenn Gerstner (St. John's University), gerstneg@stjohns.edu

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Panelist: Ira Stolzenberg (Farmingdale State College), stolzei@farmingdale.edu
Richard Vogel (Farmingdale State College), Richard.vogel@farmingdale.edu
Cristian Sepulveda (Farmingdale State College), cristian.sepulveda@farmingdale.edu
Emese Ivan (St. John's University), ivane@stjohns.edu
Glenn Gerstner (St. John's University), gerstneg@stjohns.edu

Session D3 Labor Economics 2
2:35 to 3:55 pm, Business Building 221
Chair: Craig Rogers (Canisius College), rogersc@canisius.edu

Title: Non-employment responses to the Great Recession by demographic characteristics

Author: Robert Jones (Skidmore College), rjones@skidmore.edu
Discussant: Bo Li (Stony Brook University), bo.li.3@stonybrook.edu

Title: Exploratory Spatial Data Analysis: Tracking the Spatial Evolution of Employment Centers in the Buffalo MSA: 1980 -2010
Author: Craig Rogers (Canisius College), rogersc@canisius.edu
Discussant: Meiping Sun (Columbia University), ms4196@columbia.edu

Title: The Puzzle of Mistaken Millions: The MTA Surcharge and the Surge of Money onto MetroCards
Author: Meiping Sun (Columbia University), ms4196@columbia.edu
Discussant: Gerald Grayson (Farmingdale State College), graysog@farmingdale.edu

Title: The Legacy of the Obama National Labor Relations Board (NLRB)
Author: Gerald Grayson (Farmingdale State College), graysog@farmingdale.edu
Discussant: Robert Jones (Skidmore College), rjones@skidmore.edu

Session D4 General Economics and Teaching 2
2:35 to 3:55 pm, Business Building 315

Chair: William P. O'Dea (SUNY Oneonta), odeawp@oneonta.edu

Title: A Theoretical Analysis of Student Evaluations of Instruction Using a Modification of the MCKemzie Model
Authors: William P. O'Dea (SUNY Oneonta), odeawp@oneonta.edu
Discussant: Amarendra Sharma (Elmira College), asharma@elmira.edu

Title: The Perception of Information: How U.S. News and World Report College Rank Impacts Reader Evaluation of an Author's Work?
Author: Amarendra Sharma (Elmira College), asharma@elmira.edu
Michael Girard (Elmira College)
Discussant: Philip Sirianni (SUNY Oneonta), sirianp@oneonta.edu

Title: Teaching the Separation of Income and Substitution Effects of a Price Change: A Class Exercise for Microeconomics Students
Authors: Philip Sirianni (SUNY Oneonta), sirianp@oneonta.edu
Discussant: Darleen Braunshweiger, (Nassau Community College), Darleen.Monaco@ncc.edu

Title:	Children's Pre-Kindergarten Setting and Its Impact on Academia and Behavior in the Fall of Kindergarten
Authors:	Darleen Braunshweiger, (Nassau Community College), Darleen.Monaco@ncc.edu
Discussant:	Clair Smith (St. John Fisher College), csmith@sjfc.edu

Title:	Multidisciplinary Use of Common Texts: "Fisher Reads" in Economics
Authors:	Clair Smith (St. John Fisher College), csmith@sjfc.edu
Discussant:	William P. O'Dea (SUNY Oneonta), odeawp@oneonta.edu

4:00 pm - 5:00pm Business Meeting (All Are Welcome), Business Building 124

The New York State Economics Association

69th Annual Conference

Keynote Speaker: Dr. Solomon W. Polacheck

Campus Center Ballroom, Farmingdale State College

11:30 AM, October 8th, 2016

Solomon W. Polachek is Distinguished Professor at the State University of New York at Binghamton (Binghamton University) where he has taught since 1983. From 1996-2000 he served as Dean of the Arts and Sciences College. Polachek received his Ph.D. from Columbia University and has held post-doctoral fellowships at the University of Chicago, Stanford, and Princeton. He coauthored *The Economics of Earnings* (Cambridge University Press) with W. Stanley Siebert, has published over 100 articles and book chapters, and presented seminars and workshops at over 60 universities. In addition, he visited Bar-Ilan University, the Catholic University of Leuven, Erasmus University, Tel Aviv University, the University of Michigan, the NBER, and the Tinbergen Institute for extended stays. Polachek is editor of *Research in Labor Economics*, on the editorial boards of a number of academic journals, and a Research Fellow at the Institute for the Study of Labor (IZA) in Bonn. In 1997 he received the Daniel Hoffman Teaching Award, in 2005 the State University of New York Chancellor's Award for Excellence in Teaching, and in 2011 the Leading Book Series Editor Award from Emerald Press. He was elected to serve as President of the Peace Science Society during 1999-2000 and President of the Eastern Economic Association 2014-2015. His research spans two main areas. First is the application of life-cycle models to understanding earnings differences across demographic groups, particularly men and women. Second is the integration of economics and political science to explain political conflict and cooperation among nations.