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DETERMINANTS OF RETURNS TO HOMEOWNERSHIP: COUNTY LEVEL ANALYSIS FROM 1999 TO 2009

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ABSTRACT

This paper uses U.S. Census data to analyze returns to homeownership at the county level from 1989 to 1999. We calculate returns to homeowners for 3,133 counties in the U.S., over the ten year period. We find the vast majority of counties have significantly positive returns to homeownership over the period. We also find returns are widely dispersed across different areas of the country, but the highest returns are in U.S. Census division 7, which includes Arkansas, Louisiana, Oklahoma and Texas. We also find the percentage of renters in the county is positively related to returns to homeowners and the population of the counties impacts returns, with higher returns in more rural counties.

INTRODUCTION

Homeownership has always been an integral part of the 'American Dream.' Homeownership has been attributed to building stronger communities. Most people dream of owning their own home and people take pride in becoming homeowners.

At the macro level, the housing industry has always been a major contributor to economic growth. Its impact on the overall U.S. economy was made quite demonstrably evident over the last decade or so. The housing sector was the major driver that helped us pull out of the dot com crash of 2000 and 2001. It also was the primary tipping point for the crash of 2008. Many economists have argued that a robust, sustaining recovery will not take place without a housing sector that is once again growing and creating jobs. With the Case-Shiller index recently showing the first signs of life since the housing crash (it ended the second quarter of 2012 with positive annual growth for the first time since summer, 2010), there appear to be hopeful signs on the horizon.[1]

Over the last few years, the causes of the housing crisis (especially at the national level) have been discussed and debated extensively in the popular press. However, there is a paucity of empirical research that examines the returns to homeownership at the local level over this 'unusual' period. With that in mind, we analyze the returns to homeownership at the county level for the 1999 – 2009 period. While there is quite a significant variation of returns across the

3,133 counties examined, most returns are positive and quite significant. We further examine the determinants of these returns using a variety of socioeconomic and demographic factors. We find geographic location, population density, percent of renters in the county, and the availability of vacant houses for sale to be factors that significantly affect the returns. We also examine the mortgage lending practices, but don't find subprime lending to be a factor that affects the returns during this period.

The next section of the paper reviews the existing literature and provides the motivation for our paper. The data sources and methodology used are described next. Findings and a discussion of our results follow. The final section contains our conclusions and recommendations for further research.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Given the importance of the housing sector—both to the individuals and to the broad economy—much research has focused on the risk and return in the housing market. Articles in the popular press have analyzed the rent versus buy decision with a focus on 'breakeven horizon.' Using data crunched by Zillow, CNNMoney recently reported results for ten major cities in the U.S.[2] The article defines breakeven horizon as, "the length of time a new homebuyer would have to own their home before it would make better financial sense to buy, rather than rent?" In Boston, New York, Los Angeles, and San Francisco, homes were expensive enough that it would generally make sense to rent—in spite of the rents being high as well. In the other 6 cities (Chicago, Dallas, Philadelphia, Washington D.C., Miami and Atlanta) the decision leaned towards buying since the breakeven horizons were well under 3 years. While a number of studies have utilized nationwide data; quite a few others have focused on regional market data. Using data for four large metropolitan areas, Case and Shiller (1990) demonstrate that price changes are a function of factors such as construction costs and changes in adult population.

Rose (2006) analyzes the investment value of home ownership. The author calculates the returns based on cash outflows needed to purchase a home. She incorporates tax savings, differences in cash flows for buying versus renting and assumes a 5% annual home price appreciation. She concludes that home investment may be one of the best long-term investments. Cannon, Miller, and Pandher (2006) conduct a cross-sectional risk-return analysis that covers the metropolitan housing market. Using zip code level housing data for 155 urban MSAs for the 1995-2003 period, they find that housing returns are positively related to volatility and price level. They further find that median income, gross rent and population density have positive impact on returns whereas managerial employment has negative—unemployment rate and percent owner occupied are not significant. In an attempt to use a multifactor asset pricing model to explain metropolitan-specific housing returns for MSAs, Case, Cotter, and Gabriel (2011) examine a more recent period from 1985 – 2007. Using 151 MSAs, they find a strong

relation between MSA specific house price returns and market risk, and only limited significance for size, idiosyncratic risk, and momentum in the determination of MSA housing returns.

Almost all studies in this area indicate a strong need for us to better understand the variation across different markets as returns on housing investments vary considerably across regions. Chinloy and Cho (1997), for example, find that the correlation between returns on housing in different cities can be very low or negative. Each Metropolitan Statistical Area (MSA) has unique characteristics that impact the returns to homeowners. Factors like the MSA's population growth, the growth of the labor market in the MSA, the supply of rental property, and the level of new housing construction vary across different regions. Additional factors that influence the price levels and appreciation rates of homes in an area, including property and income tax rates, also have distinctive local or statewide characteristics. These significant differences in economic and demographic characteristics and the low correlation of housing returns across cities point to the need for analysis at localized level. Brown and Chhachhi (2007) examine returns of 208 MSAs over the 1989-1999 period. They find a significant difference in returns to homeowners across MSAs, with the highest returns in the North Central United States. They also find income growth and percentage of renters in the MSA impact the returns to homeowners. Similarly, Jud and Winkler (2002) use MSA level data to investigate the factors that impact real housing price appreciation. They find population growth, real changes in income, construction costs, and interest rates influence real housing price appreciation.

In a later study, Jud and Winkler (2005) analyze the return and risk on a single-family, owner-occupied housing at the MSA level. A homeowner who purchased a home in the first quarter of 1978 and held it through the fourth quarter of 2001 would (with no leverage) have earned a compound annual return of 11.81%. Furthermore, they found that returns as well as risk varied widely among the 42 MSAs examined—in some cases as much as three fold.

In a recent study, Goetzmann et al. (2012) argue that sharp increases in housing prices in the early 2000s had tremendous impact on mortgage lending. Using 2006 Home Mortgage Disclosure Act (HMDA) data they find significant positive correlation between 2006 mortgage applications and home price increases between 2000 and 2005 for both prime and subprime mortgages. Their results indicate that in MSAs with greater past home price growth, the demand for prime and subprime mortgages was higher and the applicant pool was riskier. Hung and Tu (2008) examine the factors that led to tremendous price appreciation in single family housing in California during 2000-2005. They report that, after taking into account socioeconomic and demographic factors, extensive use of alternative mortgage products played a pivotal role in the housing price boom in California.

As expected, a lot of recent articles and studies have examined the role subprime lending played in the extraordinary housing boom of the early 2000s that was followed by an equally remarkable housing crash that began in 2007 and one that is still reverberating through the sector and the economy as a whole. Brooks and Simon (2007) conclude that many subprime borrowers

had high credit scores and would have qualified for more conventional products with better loan terms. They further argue that these creditworthy borrowers are more likely to stick with the loan and have not defaulted yet. In a very timely study, Wheaton and Nechayev (2007) examine the causes of home price increases over 1998 – 2005. They argue that the growth rate in excess of that implied by economic fundamentals, such as growth in population, income growth and decline in interest rates may be due to large demand for second/investment homes and the emergence of various, new mortgage instruments. While they find some statistical association, they also warn against inferring too strong a causal relationship between these new instruments and formation of the housing bubble.

The primary question that is addressed in our work is the following: "What kind of returns could a homeowner have expected to earn during the 1999 – 2009 period?" How attractive an investment is housing for a long-term investor? While recognizing that the results of our work cannot be used to draw conclusions for a short-term investor, our intent is to examine the returns over a decade long holding period. Our paper extends the work of earlier studies such as Jud and Winkler (2002), Brown and Chhachhi (2007), and others, by measuring the returns to homeownership for 3,133 counties in the United States from 1999 – 2009. Most of the earlier work in this area (including Jud and Winkler (2005)) has been done at the MSA level. Over time, however, the constitution of MSAs change, in many cases quite dramatically. In addition, there are typically somewhat fairly significant variations within large MSAs. These variations cannot be picked up by studies that consolidate data at the MSA level. For example, one of the cities studied in the recent CNNMoney article is the Boston metropolitan area.[2] The breakeven horizon was as low as two years in the town of Lawrence but as high as a decade in suburbs like Concord and Brookline within the same MSA.

We believe examining the returns to homeownership at the county level will allow us to develop keener and more precise insights. Furthermore, most of the studies that have examined the returns to homeownership at the national level have done so for the periods prior to 2002. While a few recent studies (for example, Wheaton and Nechayev (2007) and Goetzmann et al., (2012)) incorporate data going as far as 2005, we know of no comprehensive, nationwide studies that exist in this area that extend the data period to include not only the boom (early 2000s) but also a significant portion of the subsequent bust (late 2000s). As policy decisions affecting homeownership are debated in Washington D.C. and beyond, insights from the first decade of the century are essential. Finally, the role of subprime lending in the housing boom and subsequent crash has been extensively discussed and debated in the popular press as well as political circles. Our study examines the role of subprime lending, at the county level, in returns to homeownership during this period.

DATA SOURCES AND METHODOLOGY

Data

Most of the data used in this paper comes from the U.S. Census Bureau. Data for 2000 comes from the 2000 Decennial Census. Data for 2010 comes from the 2010 Decennial Census or the 2010 American Community Survey.[3] Mortgage rates come from the 30 year conventional loan rate monthly data published by the Economic Research Division of the Federal Reserve Bank of St. Louis.[4] Data on subprime lending by county in 2005 was collected from Dataplace.org.[5]

Homeownership Returns

The median home price for 1999 and for 2009 for each county is used to estimate the changes in the value of the residence over the ten year period. The analysis assumes a home is purchased at the median home price with a 20 percent downpayment and a 30 year mortgage. The initial interest rate on the mortgage is 7.91%. This was the average 30 year conventional loan rate in December, 1999. We also assume an initial transaction cost of two percent of the 1999 home price. The analysis assumes the remaining loan balance is refinanced in January, 2004 at a rate of 5.88%. This was the average 30 year conventional loan rate in December, 2003. The refinancing is based on the assumption that a rational homeowner will refinance whenever interest rates drop by two percent or more. Given our ten year original holding period, no further refinancing is assumed. The transaction cost at the time of refinancing is assumed to be 1.5 percent of the mortgage balance being refinanced.

In order to simulate real-life homeownership, we collect and incorporate all the variables in the return calculations that would impact a 'real' homeowner. Real estate taxes are collected for each county in 1999 and 2009 and we use the average of these taxes as cash outflows each year. Annual property insurance and maintenance costs are assumed to be 1.5% of the market value of the property.

In addition to incorporating 'typical' homeownership expenses listed below, we also explicitly include rental cost in our analysis. Specifically, we argue that in the absence of homeownership, the investor would have to rent a similar residence in the same county. Thus, we include an imputed rental cash flow each year. This is based on median contract rent in 1999 and 2009. We use these two numbers to calculate an annualized growth rate over our ten year holding period window and subsequently use this growth rate to adjust the rental cost for each year. Specifically, our cash flows for each year and after-tax internal rate of return for the ten year holding period are computed as follows (the equation below is based on the work of Miller and Sklarz (1989) and Jud and Winkler (2005), among others):

$$0 = \frac{ICO_0}{(1+r)^0} + \sum_{t=1}^{n} \frac{ACF_t}{(1+r)^t} + \frac{TCF_n}{(1+r)^n}$$

where:

r	= The after-tax IRR
ICO_0	= The initial cash outflow at time 0, based on a 20 percent downpayment.
ACF_t	= Annual cash flow in period t, where:
	$ACF_t = IR_t - PP_t - IP_t(1-T) - PT_t(1-T) - IM_t$
IR_t	= Imputed rent in period t
PP_t	= Annual principal payment in period t
IP_t	= Annual interest payment in period t (the initial mortgage is assumed
T	= Income tax rate
PT_t	= Property tax in period t
TCF_n	= The terminal cash flow at time n, where:
	$TCF_n = SP(1-0.06) - MB_n$
SP	= Sales Price (.06 is assumed to be real-estate selling fees)
MB_n	= Mortgage balance in period n

As discussed above, the interest and principal payments in years 1 – 4 are based on the 30 year conventional mortgage at 7.91%. At the end of year 4, the principal balance is refinanced at 5.88%. The interest and principal payments in years 5 – 9 are then based on the 30 year conventional mortgage at the new, lower rate.

We also take into account the tax benefits of owning a home—i.e., tax deductibility of interest and real estate taxes. Two internal rate of return calculations are performed for each county. The first assumes the homeowner receives no tax benefit. The other assumes a marginal tax rate of 35 percent.[6] The 0 percent and 35 percent calculations show the range of returns based on the minimum and maximum tax deduction.

The returns calculated under the assumption of 0% marginal tax bracket not only include people who are truly paying no income taxes but, perhaps more importantly, include homeowners who are choosing the standard deduction (as opposed to itemizing) on their Federal filing. This decision could be based on any number of factors, such as low value of the home (and thus, lower interest amount), availability, or lack thereof, of other deductions (such as living in a low or no state income tax state), impact of Alternative Minimum Tax, etc.

DETERMINANTS OF RETURNS

We conduct an ordinary least squares (OLS) regression using the internal rates of return as dependent variables and omitting any variables that are used to calculate the returns. The

selection of independent variables to use in our model is based on previous research in this area, including the work of Jud and Winkler (2005), Cannon, Miller and Pandher (2006), Brown and Chhachhi (2007) and Goetzmann et al (2012).

Jud and Winkler (2002, 2005) and others find home values and returns to homeownership vary across different regions of the country. We use the nine divisions set by the U.S. Census Bureau.[7] We use eight dummy variables to represent divisions 1-7 and division 9. The default division is division 8. The states in each division are shown in Table 1. States in the default division are Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada and Wyoming.

Table 1: States Included in Each Census Division	
Divison	States
1	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
2	New Jersey, New York, Pennsylvania
3	Indiana, Illinois, Michigan, Ohio, Wisconsin
4	Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
5	Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina , South Carolina, Virginia, West Virginia
6	Alabama, Kentucky, Mississippi, Wisconsin
7	Arkansas, Louisiana, Oklahoma, Texas
8	Arizona, Colorado, Idaho, New Mexico, Montana, Utah, Nevada, Wyoming
9	Alaska, California, Hawaii, Oregon, Washington

We include the percentage of occupied units that are occupied by renters. If a high percentage of properties are rental properties, that may be an indication that occupants prefer to rent and there may not be as many potential homeowners. On the other hand, a high number of renters can be seen as potential homeowners, since most people rent prior to purchasing a home. Previous studies find a higher percentage of renters in an area to be negatively associated with home price appreciation and returns to homeownership.

Articles in the popular press and some recent research point to vacancy rates as a reason for falling home prices. We use the percentage of housing units that are vacant and for sale in each county as of the last American Community Survey prior to the 2010 Decennial Census as our vacancy variable.

Miller and Pandher (2006) and Goetzmann et al (2012) find population density is a significant variable in explaining home price movements. We split our counties into quintiles based on population and create a dummy variable for the quintile with the highest population and a second dummy variable for the quintile with the lowest population. We compare the top 20 percent of counties and the bottom 20 percent of counties to the remaining 60 percent to see if the size of the county is significant in determining returns to homeownership.

Finally, we include the percentage of home purchase loans in 2005 that were originated as subprime loans for each county in our sample. Subprime lending has been discussed in numerous research studies and, likely, in every major business-related media outlet in the United

States over the past few years. Subprime lending is a popular scapegoat for the housing bubble and subsequent bust. Brooks and Simon (2007) point to 2005 as the peak year for subprime lending. While our review period for returns starts prior to the emergence of subprime lending and ends after the bust, we include this variable to determine if the long run return to housing is significantly impacted by subprime lending activity.[8]

FINDINGS

Returns to Homeowners

We compute returns to homeownership based on a ten year holding period for 3,331 counties in the U.S. In addition to the IRR calculations, we calculate the net present value (NPV) of housing investments (at a discount rate of 7%) for each county under two assumptions: (1) no tax benefits to homeownership, and (2) homeowners receive the maximum 35 percent tax benefit.[9] Selected return information is shown in Tables 2-5.

Assuming no tax benefits from homeownership, the highest rates of return are in Terrell County, Texas (53.01 percent). The next nine highest counties have returns ranging from 38.21 percent to 40.83 percent (Table 2). Five of the top ten county returns are in Texas. No other state has more than one county in the top ten in returns.

Table 2: Best and Worst County Returns Assuming No Tax Benefit (Ret0)		
County	Return	NPV@7%
Top 10 County Returns		
Terrell County, Texas	53.01%	$26,810
Wade Hampton Census Area, Alaska	40.83%	$36,003
Blaine County, Nebraska	40.32%	$28,364
King County, Texas	40.12%	$124,748
Slope County, North Dakota	40.00%	$24,752
Winkler County, Texas	38.68%	$20,271
Reeves County, Texas	38.65%	$15,828
Emporia City, Virginia	38.32%	$192,920
McDowell County, West Virginia	38.31%	$16,008
Hall County, Texas	38.21%	$19,830
Bottom 10 County Returns		
County	Return	NPV@7%
Livingston County, Michigan	-6.83%	(55,473)
Oakland County, Michigan	-6.51%	(51,294)
Hinsdale County, Colorado	-6.13%	(68,528)
Thomas County, Kansas	-5.36%	(18,576)
Macomb County, Michigan	-5.13%	(35,156)
Robertson County, Kentucky	-5.08%	(14,204)
Pitkin County, Colorado	-5.05%	(156,443)

Table 2: Best and Worst County Returns Assuming No Tax Benefit (Ret0)		
County	Return	NPV@7%
Geauga County, Ohio	-4.83%	(52,288)
Lapeer County, Michigan	-4.79%	(36,073)
Banner County, Nebraska	-4.63%	(17,134)

The lowest returns are in Livingston County, Michigan with a return of -6.83 percent. Oakland County, Michigan has the second lowest return (-6.51 percent) followed by Hinsdale County, Colorado (-6.13 percent). Four of the ten counties with the lowest returns from homeownership (assuming no tax benefit) are in Michigan.

Table 3 shows the highest and lowest returns to homeownership assuming the maximum 35 percent tax benefit for interest expense and real estate taxes. Most of the counties listed for the best and worst returns assuming no tax benefit remain on the list assuming a 35 percent tax benefit. Terrell County, Texas returns increase to 62.75 percent. Other counties on the best returns list have returns ranging from 46.24 percent to 49.39 percent.   The worst returns under this assumption are in Hinsdale County, Colorado with a return of -1.14 percent. Only three of the 3,133 counties have negative returns assuming a 35 percent marginal tax benefit.

Table 3: Best and Worst County Returns Assuming 35% Marginal Tax Rate (Ret35)		
County	Return	NPV@7%
Top 10 County Returns		
Terrell County, Texas	62.75%	$30,637
Blaine County, Nebraska	49.39%	$33,442
Reeves County, Texas	49.33%	$19,817
Wade Hampton Census Area, Alaska	49.10%	$41,549
Winkler County, Texas	48.13%	$24,633
Slope County, North Dakota	47.60%	$28,296
Hall County, Texas	47.37%	$26,713
Cochran County, Texas	47.05%	$24,449
King County, Texas	46.29%	$134,060
McDowell County, West Virginia	46.24%	$18,808
Bottom 10 County Returns		
County	Return	NPV@7%
Hinsdale County, Colorado	-1.14%	($40,402)
Pitkin County, Colorado	-0.004%	($90,797)
Livingston County, Michigan	-0.003%	($27,674)
Oakland County, Michigan	0.005%	($23,280)
Geauga County, Ohio	1.14%	($24,290)
Lapeer County, Michigan	1.52%	($15,816)
Robertson County, Kentucky	1.61%	($6,046)
Banner County, Nebraska	1.86%	($7,169)

Table 3: Best and Worst County Returns Assuming 35% Marginal Tax Rate (Ret35)		
County	Return	NPV@7%
Macomb County, Michigan	2.02%	($13,571)
Delaware County, Ohio	2.21%	($6,801)

We also calculate the highest and lowest NPV under the assumptions of (1) no tax benefit and (2) a marginal tax benefit of 35 percent. The results of the NPV analysis are reported in Tables 4 and 5. Two census areas in Virginia lead the way with the highest NPVs. Emporia city, Virginia had a NPV of $192,920 assuming no tax benefit and an NPV of $205,885 assuming a 35 percent tax benefit. Fairfax city, Virginia has an NPV of $151,512 with no tax benefit and an NPV of $183,254 assuming a 35 percent tax benefit. Five of the top 10 returns using the NPV analysis are in Virginia with another in the District of Columbia.

Table 4. Highest NPV Counties*		
County	NPV w/no Tax Benefit	NPV w/35% tax benefit
Emporia City, Virginia	$192,920	$205,885
Fairfax City, Virginia	$151,512	$183,254
King County, Texas	$124,748	$134,060
Kauai County, Hawaii	$99,430	$127,390
Franklin City, Virginia	$95,550	$109,933
Maui County, Hawaii	$90,859	$122,030
District of Columbia, DC	$87,276	$109,335
Manassas Park City, Virginia	$81,658	$101,639
Monroe County, Florida	$80,345	$109,442
Prince William County, Virginia	$76,617	$100,673
*NPV calculation uses a 7 percent required rate of return.		

Table 5. Lowest NPV Counties*		
County	NPV w/no Tax Benefit	NPV w/35% tax benefit
Pitkin County, Colorado	($156,443)	($90,797)
Hinsdale County, Colorado	($68,528)	($40,402)
Marin County, California	($58,919)	$10,869
Santa Clara County, California	($56,219)	$3,244
Livingston County, Michigan	($55,473)	($27,674)
Geauga County, Ohio	($52,288)	($24,290)
Oakland County, Michigan	($51,294)	($23,280)
Delaware County, Ohio	($50,023)	($20,510)
San Mateo County, California	($47,566)	$14,891
Elbert County, Colorado	($45,722)	($13,275)
*NPV calculation uses a 7 percent required rate of return.		

The lowest NPV is in Pitkin County, Colorado with an NPV of -$156,443 with no tax benefit and -$90,797 with a 35 percent marginal tax benefit. The ten counties with the lowest NPVs come from four different states. Three of the lowest NPV counties are in Colorado, three are in California, two are in Ohio and two are in Michigan. All of the bottom 10 NPVs are negative when assuming no tax benefit. The three counties in California on the bottom 10 NPV list have positive NPVs when we assume a 35 percent marginal tax benefit.

Regression Results

The results of our regression models are shown in Tables 6 and 7. Table 6 shows the results of the regression model with the returns with no tax benefit as the dependent variable. Returns to homeownership are strongly influenced by the location of the county. We use dummy variables to represent the different divisions used by the U.S. Census Bureau.[7] The states in each U.S. Census Division are listed in Table 1.

Table 6. Regression Results Dependent Variable: IRR w/no tax benefit			
Variable	Parameter Estimate	t Value	P-value
Intercept	0.08228	13.98	<.0001
Division1	0.00843	1.26	0.2091
Division2	-0.01241	-2.45	0.0144
Division3	-0.04011	-10.60	<.0001
Division4	-0.00279	-0.80	0.4257
Division5	0.03846	10.85	<.0001
Division6	0.01353	3.46	0.0005
Division7	0.06406	17.34	<.0001
Division9	0.01428	2.94	0.0033
RentPct	0.04118	3.22	0.0013
PctVac	-0.42512	-2.28	0.0229
Top20	-0.00990	-4.07	<.0001
Bot20	0.02318	9.64	<.0001
PropSub	0.01136	0.86	0.3895

The dummy variables for divisions 2 and 3 are negative and statistically significant and the dummy variables for divisions 5-7 and 9 are positive and statistically significant. Divisions 1 and 4 are the only divisions where returns are not significantly different from the default division (division 8). Division 1 is located in the New England area, while Division 4 is located in the upper Midwest. The two divisions that have negative returns relative to the default division include New Jersey, New York, Pennsylvania, Indiana, Illinois, Michigan, Ohio and Wisconsin. Counties in these states, on average, have significantly lower returns to housing over the period than any of the other divisions.

All other divisions have returns to homeowners that, on average, are significantly higher than the default division. The highest returns are in division 7, where average returns are 6.4 percent higher than the default division. Division 7 consists of Arkansas, Louisiana, Oklahoma and Texas. Returns in division 5 are also quite high compared to the default region (3.8 percent higher).

While the Census division of the counties is a significant element in determining returns to homeownership, we find the percentage of renters in the county, the percentage of vacant homes that are for sale, and the county population variable is also statistically significant in explaining returns to homeownership.

The most surprising result is the parameter estimate for the percentage of renters in a county, which is positive and statistically significant. This indicates that returns to homeowners are higher in counties that have a higher percentage of occupants that are renters rather than owners. This is contrary to the relationship that most experts would expect. In fact, some municipalities are setting limits on the percentage of units that can be occupied by renters due to a concern about the deterioration of neighborhoods and home values.

There are two plausible explanations for this relationship. First, more renters in an area means there are more potential homeowners. Market developments from 2008 through 2009 made it more likely that people would move from renting to buying a home. As home prices dropped rapidly from their 2005-2007 prices and mortgage rates reached all time lows, the opportunity to move from renting to owning a home may have resulted in increased demand for homes that were on the market near the end of our review period. The second reason is that areas with a high proportion of renters might have very high rental rates. Since we use an imputed rent as a cost savings in our calculation, the higher rental rate would lead to a higher return to homeownership in those markets with high imputed rental values.

The percentage of vacant homes for sale is statistically significant and negative. This is the expected result. More vacant homes for sale in an area means the supply of housing is high, which leads to lower home prices.

The population variables that we use are dummy variables for counties with the highest and lowest populations. Counties that are in the top quintile in population are represented by the top20 dummy variable while counties in the bottom quintile in population are represented by the bot20 dummy variable. Both variables are statistically significant. High population areas are associated with lower returns to homeownership, while more rural counties have significantly higher returns to homeownership. The bottom 20 percent of counties by population have 2.3 percent higher returns, on average, than the average returns for the 20th to 80th percentile counties. Returns in counties in the top quintile in population are, on average, about one percent lower than the average returns for the 20th to 80th percentile counties.

Finally, the variable that measures the subprime lending activity in each county is the proportion of home purchase loans in 2005 that are classified as subprime loans. This variable is

not statistically significant. Based on our findings, subprime lending does not play a role in the returns to homeowners with holding periods from 1999 – 2009.

Table 7 shows the results of the regression model with the returns assuming the investor is in the 35 percent marginal tax bracket and itemizes deductions. The only differences in the regression results compared to the regression assuming no tax benefit is in the Census divisions. All of the variables that are significant in the first regression are also significant in this regression except the dummy variable for Division 2. Division 2 is negative and statistically significant assuming no tax benefit but is insignificant assuming borrowers fully itemize and are in the 35 percent tax bracket. Also, Division 4 is insignificant in the first regression and is positive and significant in the second regression.

Table 7. Regression Results Dependent Variable: IRR w/35% tax benefit			
Variable	Parameter Estimate	t Value	P-value
Intercept	0.13294	22.05	<.0001
Division1	0.01130	1.64	0.1003
Division2	0.00070	0.13	0.8934
Division3	-0.02721	-7.02	<.0001
Division4	0.00810	2.26	0.0240
Division5	0.04300	11.85	<.0001
Division6	0.02040	5.10	<.0001
Division7	0.07683	20.31	<.0001
Division9	0.01154	2.32	0.0205
RentPct	0.05401	4.12	<.0001
PctVac	-0.61553	-3.22	0.0013
Top20	-0.01196	-4.80	<.0001
Bot20	0.02788	11.32	<.0001
PropSub	0.01306	0.97	0.3340

The changes to returns in Divisions 2 and 4 indicate returns to homeownership in these divisions are highly dependent on the tax deductibility of interest and real estate tax payments. Counties in these divisions have significantly higher deductions, on average, because the level of home prices is significantly higher.

CONCLUSIONS

Returns to homeowners vary widely depending on the location of the county. Using the Census divisions to separate the counties into divisions, we find strong evidence that returns are much greater in some divisions than others. Interestingly, the divisions that have the highest

returns are not all in the same area of the country. Nor are the divisions with the lowest returns. For example, in our first regression, divisions 1 and 2 have lower average returns than the other divisions. The geography of those divisions ranges from Pennsylvania and New York to Michigan and Wisconsin. Returns are more similar in Wisconsin and New York than in New York and Connecticut. We also conclude that returns to homeownership are much higher in the south, especially in Division 7, which consists of Arkansas, Louisiana, Oklahoma and Texas.

We find the percentage of renters in a county is positively related to returns to homeownership. This is somewhat confounding based on the current belief most experts have that higher rental occupancies usually mean lower home prices. Our theory is that this could be the result of higher imputed rent in these areas or there could be pent up demand for homeownership. If either is the case, it would explain why the percentage of renters could be positively related to the returns to homeownership. Further research is needed to examine this somewhat counterintuitive result.

The population variables are also significant in explaining the variation in returns across counties. Counties that are among the largest 20 percent by population have lower average returns, while counties that are among the smallest 20 percent by population have significantly higher average returns.

There is a strong need for additional research on the returns to homeownership. Our review period had significant home price changes as the housing bubble emerged, and ultimately, popped. Returns to homeowners for the period, 1999 to 2009, were overwhelmingly positive. However, it is unlikely that buyers purchasing their homes at the height of the bubble will experience positive returns to homeownership anytime in the near future.

ENDNOTES

[1] *Http://www.Standardandpoors.com/Indices/Sp-Case-Shiller-Home-Price-Indices/En/Us/?Indexid=Spusa-Cashpidff--P-Us----*

[2] *Http://Money.Cnn.Com/Gallery/Real_Estate/2012/09/06/Buy-Rent-Cities/Index.Html*

[3] *Http://Factfinder2.Census.Gov/Faces/Nav/Jsf/Pages/Index.Xhtml*

[4] *Http://Research.Stlouisfed.Org/Fred2/Series/Mortgage30us?Cid=114*

[5] *Http://Www.Dataplace.Org/*

[6] During Most Of This Period, There Were Six Different Marginal Tax Rates: 10, 15, 25, 28, 33, And 35%. The Highest And The Lowest Rates Shown In This Study Provide A Broad Picture Of How The Returns Vary With Tax Rates. Results For Other Tax Rates Are Qualitatively Similar To What Is Shown In This Paper And Are Available From Authors Upon Request.

[7] *Http://Www.Census.Gov/Geo/Www/Us_Regdiv.Pdf*

[8] For those investors who invested during the housing bubble, long-term returns will certainly be impacted. In this study, we are focused on the returns for investment during the period from 1999-2009.

[9] Discount rate of 7% was, somewhat arbitrarily, used for NPV calculations. Seven percent is the approximate average of the two mortgage rates used in our study—7.91 and 5.88%. The NPV analysis is done solely to add another dimension to our paper. While a different discount rate would, indeed, lead to different NPVs, our regression results are based on more rigorous Internal Rate of Return calculations.

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USING FIXED EFFECTS TO ESTIMATE THE IMPACT OF MERIT PAY ON TEACHER JOB SATISFACTION

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ABSTRACT

The purpose of this study is to determine if merit pay has any significant effects on teacher job satisfaction. Using a large panel data set of public school teachers from the years 1999, 2004, and 2007, the results of this study suggest that teachers who work receive merit pay are more satisfied with their compensation and with their jobs in general than are teachers who do not receive merit pay. Interestingly, though, if one excludes those districts that do not have merit pay systems, then teachers who receive merit pay are no more satisfied with their jobs than teachers who do not. Finally, teachers who work in districts that have merit pay systems are no more satisfied with their jobs than are teachers who do not work in merit pay districts.

INTRODUCTION

Very little research has been conducted on the effects of a merit pay system on teacher job satisfaction. In one of the few studies that looked at this issue, Belfield and Heywood (2008) presented two opposing theories regarding the effects of merit pay on teacher job satisfaction. First, they theorized that teachers receiving merit pay would be more satisfied with their jobs because their incomes would be greater than that of the average teacher. This theory assumes that all satisfaction is derived from financial rewards.

Belfield and Heywood (2008) also presented an opposing theory that states that teachers receiving merit pay may be less satisfied with their jobs because their performance and hence their pay may be random. A teacher's performance may be defined in a number of ways. If performance is based upon student test scores, then that outcome depends upon a variety of factors outside of the teacher's control, such as the home environment of the student. If a teacher happens to have a large number of students in a given year who are ill-prepared, then their test scores may be less than satisfactory and the teacher's performance would also look less than satisfactory. Hence, under a merit pay system, such a teacher would not receive any merit-based compensation. In another year, the teacher may have a group of motivated and outstanding students which would then result in the same teacher receiving merit pay. Hence, under a merit pay system, a teacher's salary would be variable and random because there are many factors that may affect a teacher's performance that are beyond a teacher's control. Under the current system, however, a teacher's pay is not random because it is based on a teacher's experience and

level of education attained. Therefore, a teacher's compensation under a merit pay system would be somewhat random, which may be unsatisfactory from the teacher's point of view (Belfield and Heywood, 2008, p. 245). Finally, a merit pay system would require the establishment of a performance review system, which would increase the workload of all teachers; this increased workload would probably reduce satisfaction, especially if no merit pay is forthcoming for a particular teacher.

Given the lack of prior research in this area and given the increasing prevalence of merit pay systems, the purpose of the present study is to examine the effects of merit pay on teacher job satisfaction. Using a large panel data set of public school teachers from the years 1999, 2004, and 2007, the results of the present study suggest that teachers who receive merit pay are more satisfied with both their salaries and their jobs in general than are teachers who do not receive merit pay. However, if one examines only those teachers who work in districts that have merit pay plans, then there is no statistically-significant difference in job satisfaction between teachers who receive merit pay and those who do not. These results are consistent for both district-level and state-level fixed effects. Finally, teachers who work in districts that have merit pay systems are no more or less satisfied with their jobs than are teachers who do not work in such districts. These results suggest that merit pay increases teacher job satisfaction when that teacher receives merit pay. However, the existence of a merit pay system in a district does not affect, on average, teacher job satisfaction.

LITERATURE REVIEW

As noted earlier, one study that examined the effects of merit pay on teacher satisfaction was Belfield and Heywood (2008). Using 1999 data from the Schools and Staffing Survey (SASS) and an ordered probit analysis, it was found that merit pay was negatively related to teacher satisfaction, both in general and with regards to salaries and teaching. It is important to note, however, that the merit pay variable in Belfield and Heywood (2008) is individual in nature and denotes whether or not an individual teacher was awarded merit pay. Belfield and Heywood (2008) did not differentiate between teachers who worked in a district without a merit pay system, and those who worked in a merit pay district but who did not receive merit pay.

Several other studies looked at the effects of merit pay on worker satisfaction; those studies, however, looked at occupations other than teaching. The first of these studies was Heywood and Wei (2006). Using data from the 1988 wave of the National Longitudinal Study of Youth (NLSY) and an ordered probit analysis, the authors found that merit pay increased overall worker satisfaction. Merit pay, however, did not increase a workers' satisfaction with their co-workers or with their supervisors. A subsequent analysis using fixed effects substantiated these findings. The results of this study contradict the results of Belfield and Heywood (2008). Finally, just as in Belfield and Heywood (2008), Heywood and Wei (2006)

only looked at individual merit pay and did not consider the existence of a merit pay system at the worker's place of employment.

Artz (2008) looked at the effects of a merit pay system on worker satisfaction using data on British workers for the year 2000. Using an ordered probit analysis, his results indicated that merit pay increased worker satisfaction in large firms but not in small firms. This result may be primarily due to the fact that worker productivity in small firms is easier to monitor; thus workers in such firms may have fewer opportunities to optimize their efforts and thus be considered meritorious.

Green and Heywood (2008) looked at a sample of British workers and attempted to determine if merit pay increased worker satisfaction. Using pooled data from 1998-2004 and a covariate analysis, the authors found that workers receiving profit sharing were more satisfied with their hours, pay, and job security than workers who did not receive profit sharing. Workers receiving profit sharing and performance pay were more satisfied with their pay and job security. Finally, workers receiving just performance pay were less satisfied with work but were satisfied with job security. The results of this study suggest that performance pay has mixed effects on worker satisfaction.

Finally, there have been numerous studies that examined various other aspects of teacher merit pay (Fryer, 2011; Glewwe, Ilias, and Kremer, 2010; Glazerman and Seifullah, 2010; Goodman and Turner, 2009; Lavy, 2009, 2002; Podgursky and Springer, 2007; Eberts, Hollenbeck, and Stone, 2002; Ladd, 1999; Cooke, 1982; Kowalczyk, 1982; and Chapman and Lowther, 1982). None of these studies, however, looked at the effect of merit pay on teacher job satisfaction.

The present study differs from this prior research in several ways. First, this study will use a much larger and much more recent data set than these prior studies; individual-level data from the years 1999, 2004, and 2007 will be used. Second, this study will look at merit pay in several ways; it looks at both individual-level merit pay and the existence of district-level merit pay systems. Prior studies only examined individual-level merit pay. This type of merit pay variable may not be adequate to capture the true effects of merit pay on worker satisfaction but may only capture the effects of a merit pay system on the satisfaction of those workers who receive merit pay. Finally, both district-level and state-level fixed effects will be used to estimate the effects of individual-level merit pay on teacher job satisfaction.

The following hypothesis will be examined in the present study:

H1   *Teachers who receive merit pay will be more satisfied with their jobs than teachers who do not receive merit pay.*

H2   *Teachers who receive merit pay will be more satisfied with their compensation than teachers who do not receive merit pay.*

DATA

All data used in the present study was obtained from the Schools and Staffing Survey (SASS) which is compiled by the US Department of Education. This survey, which is conducted every three years, collects data on teachers, administrators, schools, and districts from a randomly-selected sample. The present study uses data from the 1999, 2004, and 2007 SASS. Only full-time, public school teachers were included in the sample. Any teachers with any missing data were excluded. The final sample used in the present study contains 80,760 observations. Not all teachers had observations for every year. Sample sizes were rounded to the nearest ten due to the use of restricted data.

In order to measure teacher job satisfaction, the following two questions from the Public Teacher File of SASS were used:

(1)   To what extent do you agree or disagree with the following statement? I am generally satisfied with being a teacher at this school.

(2)   To what extent do you agree or disagree with the following statement? I am satisfied with my teaching salary.

The first question refers to overall job satisfaction; the second question deals with satisfaction with one's salary. These are the only two job satisfaction questions that are included in all three years of the survey. The responses to both questions are measured on a four-point scale. The four possible outcomes are "strongly agree", "somewhat agree", "somewhat disagree", and "strongly disagree."

In order to obtain data on merit pay, two questions from SASS were examined:

(1)   Have you earned income from any other school sources this year, such as merit pay bonus, state supplement, etc.?

(2)   Does this district currently use any pay incentives such as cash bonuses, salary increases, or different steps on the salary schedule to reward excellence in teaching?

The first question refers to the awarding of individual-level merit pay; the second questions deals with the existence of a district-level merit pay system. Both of these questions have binary responses (yes or no). Unfortunately, there are several of the shortcomings with regards to the use of these questions; those shortcomings are as follows:

(1)   Regarding question (1), it is not known if the additional income was from a merit pay bonus, a state supplement, or some other pool of funds. It is reasonable to assume, however, that most teachers would only respond affirmatively to this

question if they received some type of monetary award based on excellence or merit. The reason for this assumption is because there are other questions in the SASS teacher survey that query about additional income from the school, district, or state that do not make reference to "merit pay." Hence, if a teacher received additional income for any other reason besides merit, they would probably answer affirmatively to any of the other questions regarding additional income and answer the merit pay question in the negative.

(2)   Regarding question (2), it is not known how "excellence in teaching" is defined by each individual school district; one district's definition of excellence may be quite different from another district's definition of excellence. In fact, a teacher who is considered to be excellent in one district may not be considered excellent in another district. Therefore, these measures are not consistent across districts.

(3)   Regarding both questions, it is not known if the merit pay took the form of a one-time bonus or a permanent increase in the base pay of the teacher.

EMPIRICAL TECHNIQUE AND RESULTS

Using prior research as a guide, (Bryson, Cappellari, and Lucifora, 2010; Artz, 2010; Garcia-Serrano, 2009; Gazioglu and Tansel, 2006; Bryson, Cappellari, and Lucifora, 2004; Donohue and Heywood, 2004; Hewood, Siebert, and Wei, 2002; Clark, 1997; Gordon and Denisi, 1995; Lillydahl and Singell, 1993; Meng, 1990; and Chapman and Lowther, 1982), a model of job satisfaction was constructed. Most of this prior research included race, sex, education, and experience as explanatory variables. School- and district-specific socioeconomic variables were also included in order to capture the effects of workplace conditions on individual-level worker satisfaction. Finally, the teacher's salary was also included as an explanatory variable. Given that the satisfaction variables are measured on a four-point scale, an ordered probit analysis was used. In addition, both district-level and state-level fixed effects were used to estimate the model. Since fixed-effects were used, the standard errors may be underestimated. In order to correct the standard errors and obtain appropriate measures of statistical significance, a clustered standard error approach was used.

District-level fixed effects results are presented on Tables 1 and 2, and state-level fixed effects results are presented on Tables 3 and 4. Both sets of results indicate that teachers who received merit pay were more satisfied with both their salaries and their jobs than teachers who did not receive merit pay. These results corroborate the work of Heywood and Wei (2006) and Artz (2008). Results also suggest that female elementary school teachers who earn high salaries and who work in predominantly white schools are more likely to be more satisfied than other teachers.

Table 1: District-Level Fixed Effects Teacher is satisfied with salary		
Variable	Coefficient	Test Statistic
Male	-0.0169	-1.22
Hours worked	-0.0123	-16.452***
African-American	-0.215	-4.076***
Asian-American	0.159	2.623***
White	0.048	1.05
School enrollment	-0.0000093	-0.531
Percentage of teacher's students with an IEP	0.000229	0.804
Percentage of teacher's students who are LEP	-0.00199	-3.999***
Student-teacher ratio	-0.0038	-1.422
Percentages of teachers in school who are of a racial/ethnic minority	-0.0123	-16.452***
Percentages of students in school who are of a racial/ethnic minority	-0.00037	-0.785
Teacher's years of experience	-0.0153	-14.038***
School located in urban area	-0.0593	-1.004
School located in rural area	0.0782	0.882
Teacher has advanced degree	0.0139	0.956
Elementary school	-0.185	-9.018***
Age of teacher	0.000205	0.227
Teacher is union member	-0.0982	-5.859***
Base salary	0.000037	19.468***
Teacher received merit pay	0.0437	2.241**
Significant at 5 percent level = ** Significant at 1 percent level = ***		

In order to test the robustness of the above results, another district-level fixed effects regression was estimated that excluded those teachers who worked in districts that did not have merit pay systems; results are presented on Tables 5 and 6. In both of the satisfaction regressions, the merit pay variable is insignificant. These results indicate that, in merit pay districts, teachers who earn merit pay are no more satisfied with their jobs than are teachers who do not receive merit pay. Hence, these results suggest that merit pay does not increase or decrease job satisfaction. This result, in combination with the prior result, suggests that merit pay does not have a negative effect on teacher satisfaction. Therefore, if the primary reason why a school district implements merit pay is to improve student academic achievement, then the district administrators should take solace in the fact that merit pay will have no adverse effect on teacher job satisfaction.

Table 2: District-Level Fixed Effects Teacher is satisfied with job		
Variable	Coefficient	Test Statistic
Male	-0.0489	-2.317**
Hours worked	-0.00193	-2.333**
African-American	0.204	3.552***
Asian-American	0.0259	0.397
White	-0.0337	-0.675
School enrollment	-0.000069	-3.672***
Percentage of teacher's students with an IEP	0.00011	0.351
Percentage of teacher's students who are LEP	-0.00065	-1.227
Student-teacher ratio	0.0076	2.618***
Percentages of teachers in school who are of a racial/ethnic minority	-0.00378	-5.558***
Percentages of students in school who are of a racial/ethnic minority	-0.0039	-7.519***
Teacher's years of experience	-0.00172	-1.421
School located in urban area	-0.0536	-0.842
School located in rural area	-0.034	-0.365
Teacher has advanced degree	-0.088	-5.446***
Elementary school	0.105	4.655***
Age of teacher	0.00417	4.148***
Teacher is union member	-0.0431	-2.317**
Base salary	0.0000061	2.867***
Teacher received merit pay	0.0532	2.461**
Significant at 5 percent level = ** Significant at 1 percent level = ***		

The last set of regressions estimated excluded the individual-level bonus variable and included instead a district-level variable indicating whether or not the teacher in questions worked in a school district that had a merit pay system. These regressions were only estimated using state-level fixed effects. Results for these regressions are presented on Tables 7 and 8. These results suggest that teachers who worked in districts that used merit pay were no more satisfied with their jobs than teachers who worked in districts without merit pay. These results suggest that teachers in merit pay districts are no more dissatisfied with their jobs than are teachers in non-merit pay districts. The effects of the other explanatory variables were similar to those found in the other regressions

Table 3: State-Level Fixed Effects Teacher is satisfied with salary		
Variable	Coefficient	Test Statistic
Male	-0.0149	-1.199
Hours worked	-0.0118	-17.818***
African-American	-0.309	-6.399***
Asian-American	0.186	0.329
White	-0.0526	-1.226

Table 3: State-Level Fixed Effects Teacher is satisfied with salary		
Variable	Coefficient	Test Statistic
School enrollment	-0.0000118	-1.055
Percentage of teacher's students with an IEP	0.000325	1.292
Percentage of teacher's students who are LEP	-0.000599	-1.429
Student-teacher ratio	-0.00145	-1.082
Percentages of teachers in school who are of a racial/ethnic minority	-0.0119	-17.818***
Percentages of students in school who are of a racial/ethnic minority	-0.000479	-1.771*
Teacher's years of experience	-0.0177	-18.559***
School located in urban area	-0.0744	-1.915*
School located in rural area	0.0584	3.404***
Teacher has advanced degree	-0.02466	-1.902*
Elementary school	-0.151	-10.579***
Age of teacher	-0.000575	-0.703
Teacher is union member	-0.0897	-6.201***
Base salary	0.000049	31.862***
Percentage of students in districts who receive free or reduced-fee lunches	0.000415	1.011
Length of school year in days	0.00212	1.368
Teacher received merit pay	0.0414	2.413**
Significant at 10 percent level = * Significant at 5 percent level = ** Significant at 1 percent level = ***		

Table 4: State-Level Fixed Effects Teacher is satisfied with job		
Variable	Coefficient	Test Statistic
Male	-0.0589	-4.358***
Hours worked	-0.00241	-3.351***
African-American	0.0776	1.492
Asian-American	-0.064	-1.06
White	-0.091	-1.964**
School enrollment	-0.0000345	-2.839***
Percentage of teacher's students with an IEP	0.000079	0.289
Percentage of teacher's students who are LEP	-0.000319	-0.717
Student-teacher ratio	0.00254	1.63
Percentages of teachers in school who are of a racial/ethnic minority	-0.0034	-7.939***
Percentages of students in school who are of a racial/ethnic minority	-0.00281	-9.63***
Teacher's years of experience	-0.0016	-1.542
School located in urban area	-0.0327	-0.787
School located in rural area	0.023	-1.249
Teacher has advanced degree	-0.904	-6.404***

Table 4: State-Level Fixed Effects Teacher is satisfied with job		
Variable	Coefficient	Test Statistic
Elementary school	0.122	7.816***
Age of teacher	0.00336	3.774***
Teacher is union member	-0.0476	-3.026***
Base salary	0.0000106	6.282***
Percentage of students in districts who receive free or reduced-fee lunches	-0.00339	-7.617***
Length of school year in days	0.00994	0.588
Teacher received merit pay	0.05338	2.85***
Significant at 5 percent level = ** Significant at 1 percent level = ***		

Finally, as a test of the robustness of the above results, all of the above regressions were re-estimated, but the salary variable was eliminated. The results for these regressions were the same as the results of the regressions that included the salary variable. These results are not presented but are available upon request.

Table 5: District-Level Fixed Effects Merit Districts Only Teacher is satisfied with salary		
Variable	Coefficient	Test Statistic
Male	0.077	1.885*
Hours worked	-0.0152	-6.814***
African-American	-0.35	-2.509**
Asian-American	-0.0502	-0.304
White	-0.14	-1.082
School enrollment	-0.0000518	-1.439
Percentage of teacher's students with an IEP	-0.000704	-0.886
Percentage of teacher's students who are LEP	-0.00329	-2.904***
Student-teacher ratio	-0.00279	-0.391
Percentages of teachers in school who are of a racial/ethnic minority	-0.003399	-2.157**
Percentages of students in school who are of a racial/ethnic minority	0.00078	0.584
Teacher's years of experience	-0.0111	-3.466***
School located in urban area	0.0447	0.344
School located in rural area	0.334	0.927
Teacher has advanced degree	-0.034	-0.768
Elementary school	-0.222	-4.03***
Age of teacher	0.00144	0.554
Teacher is union member	-0.0194	-0.423
Base salary	0.0000429	7.55***
Teacher received merit pay	-0.02	-0.428
Significant at 10 percent level = * Significant at 5 percent level = ** Significant at 1 percent level = ***		

Table 6: District-Level Fixed Effects Merit Districts Only Teacher is satisfied with job		
Variable	Coefficient	Test Statistic
Male	0.00341	0.077
Hours worked	-0.00586	-2.474**
African-American	-0.111	-0.729
Asian-American	-0.407	2.283**
White	-0.278	-1.934*
School enrollment	0.0000444	1.175
Percentage of teacher's students with an IEP	-0.000359	-0.425
Percentage of teacher's students who are LEP	-0.00101	-0.892
Student-teacher ratio	-0.0119	-1.617
Percentages of teachers in school who are of a racial/ethnic minority	-0.00326	-1.987**
Percentages of students in school who are of a racial/ethnic minority	-0.0057	-3.948***
Teacher's years of experience	-0.00118	-0.339
School located in urban area	-0.023	-0.165
School located in rural area	0.0598	0.146
Teacher has advanced degree	-0.057	-1.193
Elementary school	0.228	3.904***
Age of teacher	0.00656	2.333***
Teacher is union member	-0.0837	-1.694*
Base salary	0.00000106	0.176
Teacher received merit pay	0.0349	0.689
Significant at 10 percent level = * Significant at 5 percent level = ** Significant at 1 percent level = ***		

Table 7: State-Level Fixed Effects District-level merit pay variable Teacher is satisfied with salary		
Variable	Coefficient	Test Statistic
Male	-0.016	-1.289
Hours worked	-0.0118	-17.786***
African-American	-0.309	-6.399***
Asian-American	0.0194	0.344
White	-0.0516	-1.202
School enrollment	-0.00000116	-1.041
Percentage of teacher's students with an IEP	0.000322	1.279
Percentage of teacher's students who are LEP	-0.00059	-1.418
Student-teacher ratio	-0.00144	-1.078
Percentages of teachers in school who are of a racial/ethnic minority	-0.00016	-0.401
Percentages of students in school who are of a racial/ethnic minority	-0.000474	-1.754*
Teacher's years of experience	-0.01766	-18.49***
School located in urban area	-0.0744	-1.916*

Table 7: State-Level Fixed Effects District-level merit pay variable Teacher is satisfied with salary

Variable	Coefficient	Test Statistic
School located in rural area	0.0584	3.404***
Teacher has advanced degree	-0.023	-1.808*
Elementary school	-0.152	-10.614***
Age of teacher	-0.00061	-0.743
Teacher is union member	-0.0892	-6.167***
Base salary	0.0000496	31.842***
Percentage of students in districts who receive free or reduced-fee lunches	0.00041	0.996
Length of school year in days	0.00213	1.377
District has merit pay system	0.0115	0.483
Significant at 10 percent level = * Significant at 1 percent level = ***		

Table 8: State-Level Fixed Effects District-level merit pay variable Teacher is satisfied with job

Variable	Coefficient	Test Statistic
Male	-0.0604	-4.465***
Hours worked	-0.0023	-3.305***
African-American	0.078	1.507
Asian-American	-0.0625	-1.033
White	-0.0895	-1.929*
School enrollment	-0.000034	-2.816***
Percentage of teacher's students with an IEP	0.000073	0.266
Percentage of teacher's students who are LEP	-0.00031	-0.698
Student-teacher ratio	0.00252	1.629
Percentages of teachers in school who are of a racial/ethnic minority	-0.00339	-7.916***
Percentages of students in school who are of a racial/ethnic minority	-0.0028	-9.607***
Teacher's years of experience	-0.0015	-1.456
School located in urban area	-0.0327	-0.787
School located in rural area	0.0239	1.278
Teacher has advanced degree	-0.088	-6.303***
Elementary school	0.121	7.767***
Age of teacher	0.00331	3.715***
Teacher is union member	-0.0474	-3.01***
Base salary	0.0000106	6.28***
Percentage of students in districts who receive free or reduced-fee lunches	-0.00338	-7.592***
Length of school year in days	0.00103	0.609
District has merit pay system	-0.0077	-0.300
Significant at 10 percent level = * Significant at 1 percent level = ***		

One problem with much of the prior research on this topic is that typically the "merit pay" variable equals one if a teacher receives merit pay and zero otherwise. Defining merit pay in this manner may create problems when estimating the determinants of satisfaction. For example, when using such a definition of merit pay, it would probably be highly unlikely to find a teacher who receives merit pay who is unsatisfied with their job. Thus, the use of this definition of merit pay may bias the results such that one is much more likely to find a positive relationship between merit pay and job satisfaction. In addition, in districts that do not have merit pay systems, all teachers would have a zero for the merit pay variable. Hence, the inclusion of teachers from non-merit pay districts may be problematic from a statistical standpoint since they do not contribute to the variation of the merit pay variable. In order to correct for that problem in the present study, several different merit pay scenarios were estimated, including a universal sample that included all teachers and a merit pay sample that included only teachers who worked in merit pay districts. When estimated with these different data sets, the relationship between merit pay and satisfaction went from being positive for the universal sample to insignificant for the merit pay sample.

Another way in which this problem was controlled was to see whether or not a district-level merit pay system exists. Instead of including an individual-level merit pay variable, a binary variable equaling one if the district had a merit pay system and zero otherwise was included. There are potential statistical issues with the use of this treatment of merit pay as well. For example, there may be many teachers in a merit pay district who do not receive merit pay; hence, they may skew the results since they would probably be unsatisfied and would outweigh the possibly positive reactions of the more meritorious teachers in their district. Results of the present study confirm this theory because the effect of a district-level merit pay system on teacher job satisfaction was found to be insignificant.

CONCLUDING REMARKS

Due to increasing demands of accountability, school districts are putting additional pressure on teachers to perform better in the classroom. Merit pay has been proposed as one way to encourage teachers to do better. Even though merit pay systems are becoming more common, they are not very popular, especially among teachers. Most teachers believe that merit pay, with its emphasis on testing and annual assessments, discourages cooperation and creates few incentives to be creative in the classroom. In addition, teachers believe that they are being unfairly treated because the influences of other agents in the educational process (parent, students, and other teachers) are ignored; all of the blame for the failure of the student is placed squarely on the teacher.

Very few prior studies have examined the relationship between merit pay and teacher job satisfaction (Belfield and Heywood, 2008). In order to fill that void, the present study uses several different methodologies in order to examine the effects of merit pay on teacher job

satisfaction. Results of this study suggest that teachers who receive merit pay are more satisfied with their jobs than are other teachers. However, if only merit pay districts are examined, then that effect becomes insignificant. Finally, teachers who work in merit pay districts are no more satisfied with their jobs than are teachers who work in non-merit pay districts. All of these results are consistent across a series of different estimations.

The present study is significant in this body of research because, as noted above, this is one of the first studies on the topic of the effects of merit pay on teacher satisfaction. One major difference between this study and Belfield and Heywood (2008) is that, in the present study, one of the ways in which merit pay is defined is whether or not a teacher works in a merit pay district. In Belfield and Heywood (2008), the variable was defined as whether or not the teacher receives merit pay. That definition is more problematic, especially with regards to teachers in non-merit pay districts. The present study, however, provides a clearer distinction between teachers who work in a merit pay district and who are thus eligible to receive merit pay and those teachers who work in non-merit pay districts and who will never be able to obtain merit pay, regardless of how proficient they are as teachers. This distinction is important since it highlights more clearly the differences in satisfactions that may result when merit pay systems are used in an educational setting.

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DOES INDUSTRY CONCENTRATION MATTER?

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ABSTRACT

The Obama Administration has stepped up enforcement of merger activity based on the theory that when market concentration is high price and non-price competition, especially involving homogeneous products or services, will decrease.[1] The fear is that highly concentrated industries are more likely to engage in collusive behavior resulting in higher prices or restraints on output. In the present study, the history of the regulation of the US passenger airline industry between the years 1960 and 1979 reveals that even when markets contain only two or three firms, competition can be vigorous. More surprising though is that non-price competition broke out even when government blocked entry of new firms; set minimum ticket prices at the monopoly level and, would you believe, even encouraged airlines to sign flight restriction agreements to limit capacity.

During the period in which the airlines were regulated by the Civil Aeronautics Board (CAB) most city-paired markets could be characterized as being dominated by two or three airlines - and thus highly concentrated. There was growing industry demand; blocked entry; slow changing technology and fares set by the CAB above average total costs. All the necessary ingredients that would trigger a modern day "shared-monopoly" investigation by the Federal Trade Commission or the Antitrust Division of the Department of Justice were in place.

The Structure-Conduct-Performance (SCP) theories of antitrust, that dominated antitrust enforcement for most of the past thirty (30) years, is questioned. After a twenty year experiment in which the monopoly profits should have been achieved, the airline industry engaged in intense cost escalating non-price competition, until equilibrium was reached with most airlines earning only normal returns.

INTRODUCTION

Enforcement of antitrust policy, at least as it applies to horizontal mergers, is based upon the ideas and theories of the structural school of thought. Essentially, adherents of the structural school are skeptical of mergers which tend to cause post-merger industry output to be concentrated in the hands of a few major producers. They are particularly concerned when concentrated industries also have high barriers to entry.

The underlying behavioral assumption of the structural school is that when two or three large producers dominate industries, they are likely to engage in unhealthy behavior. It is argued that firms will be tempted to stifle competition by limiting output or engaging in conspiracies to raise prices to consumers and to earn economic rents over time. Most economists, at one point

or another in their lives, have probably subscribed to the structuralist view. It is reasonable to assume that if an industry is composed of three or fewer firms then we are more likely to observe cartel-like behavior, given that the cost of organizing would be fairly low with a minimal risk of detection. But this theory seems at odds with our experience from other major industry studies.

One of the dominate themes of the economics literature during the 1970's was the effort to develop empirical studies on the effects of regulation, particularly the domestic airline and trucking industries. As a result there is a rich body of literature concerning how these industries were organized and how the regulatory system operated. In reviewing these studies it is fascinating to compare the effects of regulation, in say, the airline industry with the current views of the structural school of antitrust. For example, the domestic airline industry was characterized by duopoly or oligopoly in most markets, high barriers to entry, growing industry demand, and prices set by government above average total costs. All the necessary conditions existed, one would think, for economic rents.

In what follows I examine the history of the regulation of the domestic airline industry in the US as it relates to current antitrust policy. Does the regulation of the airline industry provide a controlled experiment of the "shared- monopoly" model? Did economic rents occur in the airline industry and, if not, what was missing?

US DOMESTIC AIRLINE INDUSTRY AND ECONOMIC RENTS

The Civil Aeronautics Board (CAB) and its predecessors between the early 1930's through 1979 had regulated the airline industry in the United States. In 1979, Congress deregulated the industry with broad bipartisan support. The most significant piece of legislation establishing regulatory controls over domestic passenger service carriers was the 1938 Civil Aeronautics Act (CAA) which established the Civil Aeronautics Authority, which was changed to the Civil Aeronautics Board (CAB) in 1940. The CAB was given authority over entry into the inter-state airline passenger service and the authority to establish minimum and maximum fares.

No carrier under the CAA could operate in scheduled interstate service without first obtaining CAB permission and then only on those routes for which authority was granted. The Board could, and often did, attach restrictions, such as limiting nonstop service. The usual procedure was for the Board to hold "area investigations" during which carriers were invited to apply for extensions in their service. Carriers also could apply unilaterally. Since the Board controlled entry into paired city markets, it effectively controlled entry into the industry.

The original sixteen (16) major trunk carriers in operation in 1938 when the Act was passed received "certificates of public convenience and necessity" for all current pair city markets they operated in. However, not a single new trunk carrier had been certificated in the Board's history, although many of the local service carriers later were permitted to grow into miniature trunks[2].

The Board had considerable control over ticket prices. In fact the Board set ticket prices although technically the Act did not require the Board to do so and also the Act permitted the Board to set maximum or minimum rates if it wished.

The Act also established the conditions that were to be followed in establishing rates.

The CAB was required among other constraints to consider "the need of each air carrier for revenue sufficient to enable such air carrier, under honest, economical, and efficient management, to provide adequate and efficient air service."

This provision is consistent with the Act's requirement that the CAB promote the economic well being of the airline industry. In 1968, the then Board Chairman Charles S. Murphy said, "I wish to emphasize the fact that we are charged with responsibility to promote as well as regulate air transportation. We regard the promotional aspects of our work as very important."[3]

Finally, one of the most important areas affecting non-price competition, the CAB was prohibited by Section 401(e)(4) of the act to regulate scheduling of flights:

> *No term, condition, or limitation of a certificate shall restrict the right of an air*
> *carrier to <u>add</u> to or change schedules, equipment, accommodations, and facilities*
> *for performing the authorized transportation and service as the development of*
> *the business and the demands of the public shall require.*

Thus, carriers while they could not compete on price, they could, even if there were only two or three carriers in most city-paired markets, compete on flight scheduling. Of course, one might question why carriers would engage in non-price competition when this would reduce economic rents? This question will be visited later.

CAB ENFORCEMENT AND ADMINISTRATIVE PROCEDURES

The CAB basically followed the procedures utilized by the ICC to regulate the trucking and railroad industries. If a carrier wished to increase fares or enter a new city-paired market, the CAB would hold an administrative hearing and if another carrier opposed the rate change or the entry of a new competitor they could present evidence in opposition.

In the early history of industry regulation, the CAB viewed its role as assisting an infant industry. Broadly interpreted, the statute implied that the technology of the industry would be aided and advanced, and that the maintenance of service in markets with insufficient demand to make operations profitable.   The CAB utilized two methods to elicit such profitable services: direct subsidy of airmail service, and indirect or cross-subsidy, wherein excess profits were maintained on some routes to subsidize losses in others.

It is commonplace in regulation that indirect subsidy is preferred to direct subsidy. Accordingly, the CAB developed a policy of restraining entry into monopoly markets in order that carriers might earn profits there to offset losses in markets where exit was restricted[4].

Over time, however air traffic grew at a rate many times that of GDP resulting from superior technology, lower costs, increased quality of air travel and the fact that air travel is a superior good. The structure of the industry also changed in the1960's, with local service carriers and commuter airlines inheriting the subsidized markets. Hence, with the trunk industry's maturation, the underlying need for direct subsidy and cross-subsidy disappeared. During the period 1960-1979, the CAB's policy goal was not clearly defined.

ECONOMIC EFFECTS OF REGULATION OF DOMESTIC AIR TRANSPORT

It will be more fully developed below but generally speaking, the economic consequences of the regulation of domestic air travel resulted not in economic rents to industry participants but normal rates of return. This occurred even though entry into city-paired markets was limited most instances to two to three carriers and rates were set by the CAB at levels significantly above long run average total per unit costs.

Fares Set Above Average Total Costs

Examination of the economic literature indicates that during the thirty (30) years of CAB regulation, most attempts to change rates, rather than being instances of price competition, were attempts by the industry or the Board to bring realized profits into line with the Board's estimated "fair" or "reasonable" return on investment. The important rate cases involved across-the-board fare adjustments with the avowed purpose of adjusting the industry profits. The cases in which competitive price reductions were sanctioned principally reflected the interests of the airline industry as a whole against competing modes of transport, such as buses or automobiles. Thus, coach service and fares had been established as well as a multiplicity of promotional fares. The Board manifested an interest in each of these developments, however, in seeing that the proposed reductions were not principally "diversionary," that is, "too competitive." Moreover, examination of the regulatory history provides numerous examples of the regulator's denying incipient, competitive price reductions[5].

The most importance evidence that fares were set above average per unit costs, however, is the significant differences in fares between California intrastate markets and those for trips of similar distance in interstate markets. Air carriers who operated wholly within a state were not subject to CAB regulation, and in California specialized carriers served the major intrastate markets with vigorous price competition during the 1950's and 1960's.

According to Jordan the regulation of air carriers on these routes by the California Public Utilities Commission set only upper limits on fares and this, in conjunction with free entry and exit, resulted in price competition. Some comparisons between fares in major California

intrastate markets and fares in eastern markets under CAB regulation are reported in Table 1 below.

Table 1. Comparison of Air Fares in California Intrastate Markets with Fares in Similar East Coast Interstate Markets, July 1970.				
Markets	**Distance (miles)**	**Annual passengers**	**Coach fare (dollars)**	**Fare per mile (cents)**
California				
Los Angeles --San Francisco	340	3,023,341	16.20	4.76
San Diego –San Francisco	449	359,025	22.63	5.04
San Diego –Los Angeles	109	637,447	7.97	7.31
East Coast				
Boston-New York	186	1,985,680	21.60	11.61
Boston-Washington	413	435,920	35.64	8.63
New York – Washington	228	1,663,850	23.76	10.42
Sources: William A. Jordan, *Airline Regulation in America: Effects and Imperfections* (Johns Hopkins University Press, 1970), p. 105; and *Official Airline Guide: Quick Reference, North American Edition* (Reuben H. Donnelly, July 1, 1970)				

It is instructive to note that prices (per mile) in the regulated markets were all significantly higher than in the unregulated market (California). For example, the fare between Boston and Washington, DC was approximately 71% higher than the San Diego/San Francisco fare with a similar volume of traffic.

Perhaps the difference in fares is a result of differences in operating costs or services provided to passengers in regulated vs. unregulated markets? Jordan found that carriers in California's major markets offered similar services to passengers, operated similar aircraft and served the same airports in California as the interstate carriers. In a comparison between the coach fares available in the major California intrastate markets in 1965 and fares that would have existed had CAB regulation applied to those markets, Jordan showed that coach fares for similar interstate markets would have been between 32 and 47 percent lower than the CAB-regulated fares then in effect. Miller points out that Jordan overestimates the difference in fares because carriers in California had higher load factors, and thus fewer flights per day and fewer discount fares compared to the regulated carriers. Miller agrees with Jordan however on the essential finding that fares in regulated markets were still higher than would have been the case if carriers were free to compete on price. Consumers in interstate travel did not have the same opportunity to purchase tickets at a lower price and to forego a little quality by having fewer flights available per day[6].

Oligopolistic Nature of Typical Paired City Markets

The CAB protected the original trunk carriers from new entry from 1938 up to 1979, the year of deregulation, despite the 250-fold increase in total traffic. All attempts to form new trunk

carriers were rebuffed by the CAB. For example, in 1967, World Airways applied for permission to offer nonstop direct service from Oakland/San Francisco and Ontario/Long Beach, CA on the one hand, and New York/Newark and Washington/Baltimore, MD., on the other and promised substantial reductions in fares. According to Miller, the Board refused to act on the petition and through a technicality years later dismissed it from the docket as being "stale"[7].

In city-paired markets, the truck carriers, at least during the 1960's and 1970's were not as lucky. Prior to 1960, the CAB often gave a carrier monopoly rights in many of their city-paired markets, (New York/Miami). This was consistent with the view of the CAB as a protector of an infant industry. However, when industry demand grew during the 1960's and 1970's, the CAB allowed increased competition in city-paired markets. While in the 1950's the typical carrier generated almost 50 percent of its traffic in monopoly markets it dropped to approximately 25 percent by 1971. However, in most markets a carrier faced no more than one competitor and in no market did a carrier face more than four competitors. (See Table 2 below.)

Table 2. Percentage Share of Revenue Passenger-Miles in Competitive Markets, by Carrier, 1955 vs. 1971.		
Carrie	*1955*	*1971*
American Airlines	58.6	83.4
Eastern Air Lines	46.3	76.2
Trans World Airlines	62.9	89.3
United Air Lines	61.3	67.1
Big four share	n.a.	77.4
Braniff Airways	32.4	64.3
Continental Air Lines	12.5	79.8
Delta Air Lines	37.9	69.3
National Airlines	80.2	85.4
Northeast Airlines	8.7	87.2
Northwest Airlines	59.3	82.9
Western Air Lines	54.4	72.3
Other Trunks' Share	n.a.	75.9
All trunks	55.6	76.6
Sources: 1955, Richard J. Barber, "Airline Mergers, Monopoly, and the CAB," *Journal of Air Law and Commerce,* Vol. 28 (Summer 1961), p. 213; 1971 data from Douglas, George W. and James C. Miller III, Economic Regulation of Domestic Air Transport: Theory and Policy, (The Brookings Institution, Washington, DC), 1974.		

While the Board reduced the number of monopoly city-paired markets between 1955 and 1971, the Board was reluctant to certificate entry when, in its view, the likely effect would be to impair financially and significantly either the incumbent or the potential entrants. As opposed to a regime of free entry, clearly these are important restraints.

The CAB permitted new entry in city-paired markets during the twenty (20) year period prior to deregulation but never lost sight of their perceived role as a protector of the economic

interests of the airline industry. According to Miller, the Board considered abnormally high load factors in monopoly markets as an indication that additional service was needed. However, the Board viewed the advantages of competition almost exclusively in terms of service adequacy and neglected price competition. In fact the Board looked very unfavorably on carriers who promised lower prices if permitted to enter a new city-paired market as mentioned above in the World Airway's application denial case.

To reiterate, while the CAB allowed entry of new carriers in city-paired markets in the 1960's and 1970s, no market contained more than four (4) carriers with most markets having only two (2) or three (3)[8].

Rates of Return

Given the market protection provided by the CAB, i.e., no more than three (3) firms in any city-paired market, prices set by the CAB above average total per unit co**,** and with growing industry demand one might expect to find economic rents accruing to investors in the US airline industry during the period 1960-1979. In fact, Douglas and Miller and others who have examined this issue in the 1970's found that airlines earned "normal" rates of return on investment as can be seen in Table 3 below:

Table 3. Rate of Return on Investment, Domestic Operations of Trunk Air Carriers, in Order of Increasing Carrier Size, 1965 – 70							
Carrier	*Carrier size (measured by available ton-miles)1970 (millions)*	*Rate of Return (percent)*					
		1965	*1966*	*1967*	*1968*	*1969*	*1970*
Northeast Airlines	604		3.7	15.5	1.1	-66.8	-57.1
National Airlines	906	19.6	15.9	17.1	12.8	9.1	-1.8
Braniff Airways	1,027	14.1	15.9	2.2	5.0	5.9	3.4
Western Air Lines	1,180	14.7	15.9	10.2	6.2	-0.4	4.0
Northwest Airlines	1,217	20.4	16.0	14.2	10.4	7.7	3.8
Continental Air Lines	1,472	19.1	20.9	13.6	5.1	4.4	5.1
Delta Air Lines	2,636	23.6	28.7	18.7	14.6	12.8	11.5
Eastern Air Lines	3,139	11.5	6.0	6.5	0.8	3.0	3.6
Trans World Airlines	4,261	9.9	7.2	3.9	1.0	1.1	-4.8
American Airlines	5,307	9.4	9.8	6.6	6.1	6.4	-0.4
United Air Lines	7,337	8.9	6.7	6.9	5.0	5.8	0.7
Big Four trunks	9.7	7.6	6.1	3.7	4.4	-0.1	
Other trunks	. .	19.3	18.9	12.0	9.1	5.3	4.6
All trunks	. .	12.2	10.9	7.7	5.3	4.7	1.6
Source: Civil Aeronautics Board, *Handbook of Airline Statistics, 1971 Edition* (1972), pp. 120-31, 391. Table 2-5 in Douglas and Miller.							

According to Douglas and Miller and others[9], the average rate of return in the airline industry for the period 1955-1970 was only 6.42 percent. Only Delta Air Lines, long known for having the lowest operating costs, came close to earning above "normal" rates of return but even Delta experienced a substantial decline in earnings. Between 1965 and 1970 Delta's earnings went from 23.6 to 11.8 percent. What could explain the lack of high rates of return given that the regulatory environment in which the carriers operated?

Equilibrium and Nonprice Competition

Apparently the answer is that carriers were not satisfied with the economic rent potential and began to compete on nonprice variables. According to Douglas and Miller the airlines took price as a given and began to compete by offering consumers more flights:

> . . . "since there are so few carriers in each market, it is consistent with typical oligopoly behavior that the airlines prefer to avoid price competition, realizing that most price cuts will be met, generally to their mutual detriment . . . Essentially, therefore, airline firms rival each other primarily in nonprice, quality dimensions. Since basic outputs are so homogenous, each firm tries to establish its identity through assorted gimmicks, some innovations, and extensive advertising.
>
> Of greatest importance in nonprice rivalry is the tendency of firms to compete on scheduling and capacity. More frequent flights and more capacity can increase air traffic, both by inducing additional travel and by diverting travelers from competing modes.[10]"

Douglas and Miller explain their findings of normal rates of return most clearly with the following statement:

> "Even though entry by firms into specific (city-paired) markets is strongly constrained, nonprice competition tends to raise or lower average cost per passenger carried so that in equilibrium it is equal to price.[11]"

Essentially, the carriers would add flights in each city-paired market until average load factors approached the break-even point. Break-even load factors for 1965, for example, were approximately 47 percent. Actual load factors for 1965 were significantly above the break-even point averaging 58 percent. As indicated in Table 3 above, high rates of return, averaging 12.2 percent, were consistent with high load factors observed in 1965. By 1973, however, while break-even load factors increased slightly to 49 percent, actual load factors declined to 52 percent and industry average rates of return (for 1970) had declined to 1.6 percent.

Figure 1 below describes what happened in terms of a typical firm operating in a shared monopoly market.
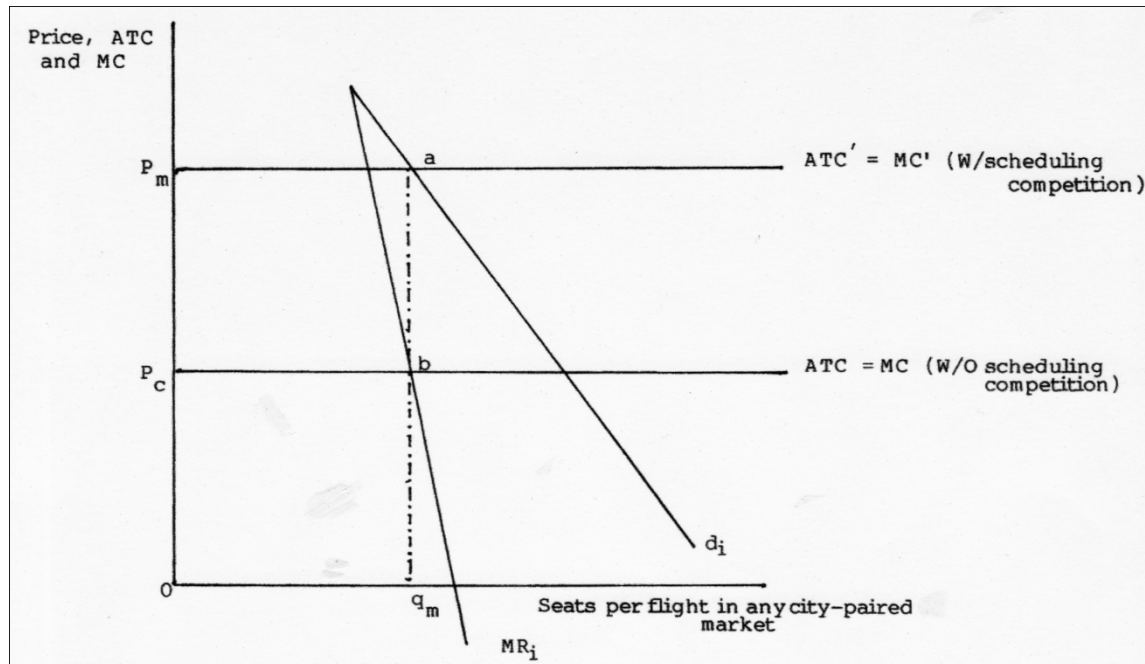
During the 1950's a typical airline operating in a city-paired market, say between Boston and Washington, DC, faced a downward sloping demand curve **d1.** The CAB set ticket prices at **pm** , which is substantially above **ATC** and **MC** of an efficiently run carrier in a constant cost industry and planes flying with 65 to 70 percent load factors. The carrier earned economic rents in the amount of **Pm,abPc,** selling **Oqm** seats per flight.

Come the 1960's and 1970's, as carriers engaged in nonprice competition by adding flights in each city-paired market, they raised their average total cost and marginal costs per available seat to (**ATC' and MC'**) by adding flights but not by adding passengers. Thus, per available seat costs increased until the equilibrium was reached at the break-even load factor, of, say 49 percent. In the end, carriers were earning normal rates of return and consumers were paying the "monopoly" price of **pm** but enjoying the increased availability of flights and planes were flying half empty. Business travelers particularly benefited since they valued having more flights to choose from and were relatively indifferent to ticket prices.

THE HISTORY OF THE AIRLINE REGULATION AND CURRENT ANTITRUST POLICY

What is the relationship between the results of regulation of the US domestic passenger airline industry and modern antitrust enforcement activity? Since antitrust policy is predicated on the notion that firms in concentrated industries are likely to engage in anticompetitive behavior, the history of the regulation of the airline industry raises serious questions about modern antitrust policy – in particular the current merger policy guidelines being employed by the Obama Administration.

Empirical Economic Research Underlying Antitrust Policy

The structural school of antitrust dominated antitrust policy from the beginning of the Kennedy administration in 1960 up through the Carter administration ending in January of 1981. There was an eight (8) year break during the Reagan administration when the Chicago School was in control but the structural school regained marginally with the first Bush administration and completely dominated again during the Clinton administration and now in the Obama administration.

Based on the writings and research of Turner[12] and Bain[13] followed by a slew of empirical structure-conduct and performance (SCP) studies by economists such as Mann[14], Weiss[15], and F.M. Scherer[16], it was generally held during the 1960's, 1970's and 1990's that there was an identifiable and systematic link between indicators of market power and firm profitability.

Generally, these authors performed SCP studies where they statistically related industry concentration, using the eight-firm concentration ratio, and profits. In a survey of almost fifty (50) of the SCP studies published between Bain's first paper in 1951 and 1974, Weiss found that an over-whelming majority of these studies reported a significantly positive relationship between high concentration and industry profitability. Even Stigler, who was more closely affiliated with the Chicago School of thought, found that there appeared to be evidence of a positive relationship between concentration and profits for a small number of industries having Herfindahl-Hirschman indexes above 2,500 (out of a maximum of 10,000) or four-firm concentration ratios exceeding 80 percent[17].

During the 1970's the Chicago School began to publish studies that raised questions about the SCP theory and empirical works. Peltzman[18] reviewed 165 four-digit SIC consumer and producer goods industries over the 1947-67 period and found that cost reductions appeared to be significantly larger in industries with high concentration compared to industries characterized by low concentration levels. Peltzman examined whether monopoly elements in the industries characterized by rising concentration had caused prices to increase enough to offset the efficiency gains. He regressed changes in concentration, unit costs, and total revenues

on industry price indexes and reported that while less than the full amount of the realized cost reductions had been passed on to consumers in the form of lower prices, the net effect of higher concentration was to reduce prices substantially. Thus, Peltzman concluded that profits rise when concentration rises, not because prices rise, but because they fall more slowly than costs.

Merger Guidelines, Concentration and Antitrust Policy Enforcement

Despite the lack of consensus in the academic community over the relationship between market concentration and anticompetitive pricing, merger policy in the US is predicated on the notion that anticompetitive actions are likely to increase with market concentration, at least with concentration levels beyond some threshold. The most common accusation in this respect is that increased concentration of industry output will heighten the prospects for explicit or tacit collusion.

This view is enshrined in the principal guidepost to antitrust enforcement of the Clayton Act – the *Horizontal Merger Guidelines* issued by the Department of Justice (DOJ) and the Federal Trade Commission (FTC) in 1968 and most recently by the Obama administration[19]. After defining the relevant market by the DOJ or the FTC the *Guidelines* require the calculation of the pre and post-merger Herfindahl-Hirschman Index (HHI).

The HHI is the sum of the squared market shares of every firm in the market:

$$\text{HHI} = \sum_{i=1}^{n} S_i^2$$

where S^2 denotes the market share of the ith firm and **n** represents the number of firms in the market. The upper bound (pure monopoly) would be 10,000 (100^2). If the post-merger HHI is above 2,500, the agencies consider the market to be highly concentrated and if the merger contributes more than 200 points to the HHI, the *Guidelines* state the merger would "be presumed to likely enhance market power. The presumption may be rebutted by persuasive evidence showing that the merger is unlikely to enhance market power.[20]" As President Obama's antitrust chief recently stated when commenting on the new *Guidelines* " The HHI thresholds were thus best suited to evaluate concerns about collusion in markets for homogenous products.[21]"

The antitrust agencies would then proceed to examine entry conditions and if entry is found too difficult or expensive, it is presumed that the merged firms will be able to raise price and earn economic rents over time. The antitrust agencies will examine other aspects of the proposed merger such as the extent of excess capacity, growth and changing cost conditions in the industry as well as possible efficiencies that might arise. Firms in rapidly growing industries

and ones with changing cost conditions will find it difficult to establish and maintain a conspiracy to limit output or raise prices. Firms in industries with substantial amounts of excess capacity will discover the incentives to cheat too great to maintain cartel-like agreements.

It is difficult to know how much emphasis is placed on each portion of the *Guidelines* by the agencies when it comes to evaluation of a particular merger but it is believed that the extent of increase in concentration plays a major role. Consistent with Section 7 of the Clayton Act, the 2010 *Guidelines* state that the agencies "give weight to the merging parties' market shares in a relevant market, the level of concentration, and the change in concentration caused by the merger[22]" Thus, both the legal foundations of antitrust merger law and the enforcement standards are squarely in the camp of halting any tendency toward monopoly "in its incipiency." The level of concentration, as measured by the HHI, is the measure employed to predict the tendency toward monopoly.

Airline Regulation, Concentration and Profitability

Let us now connect the first section of the paper with the second. Earlier it was demonstrated that the regulation of the airline industry spanned a period of forty (40) years and that during the latter portion of this period, 1960's and 1970's, the CAB implemented regulatory policies resulting in the following market conditions:

- **Markets Highly Concentrated and Entry Blocked.** The CAB limited the number of airlines in each city-paired market to two to three carriers and in a few cases four. Assuming equal market shares, the HHI for each market ranged between 3,267 (three carriers) and 5,000 (two carriers). Thus, the minimum HHI in each city-paired market far exceeded what antitrust authorities would consider today to be highly concentrated (any HHI above 2,500). Not only would the DOJ or FTC challenge proposed mergers in markets with these HHI numbers but would probably consider it a shared-monopoly case under the Sherman Act.

- **Monopoly Level Fares.** The CAB set airline fares at the monopoly level – 32 to 47 percent higher than comparable fares in unregulated markets. The airlines did not have to conspire or engage in pricing practices that would produce the monopoly result. They did not have to worry about "cheating" by competitors as would be the case in an unregulated market.

- **Growing Industry Demand** without major changes in airline passenger transportation technology during the 1960' and 1970's. In other words, unlike the rapid changes that are occurring today in the information technology industry,

business conditions were fairly stable with moderately growing demand for airline travel.

- **Homogeneous Market.** Modern airline travel is considered by most passengers as a "commodity". Consumers now easily shop on the internet based on price and length of travel time thus market concentration would create the possibility for collusion.

Given the above market conditions it would seem we have the perfect environment for firms to earn economic rents without having to engage in any conspiracy or "conscience parallelism" to restrict output or raise prices. We also have the opportunity to observe the firms in this industry for a period of twenty (20) years, that is, we should be able to examine the long-run equilibrium conditions.

What happened? For some unknown reason, airlines engaged in **non-price competition**. Not satisfied with the potential to earn substantial profits over time, the airlines engaged in competitive conduct by adding capacity to their city-paired markets, which the CAB was not permitted to regulate without the consent of the airline industry, thus eroding their economic rents[23].

It should be stressed that according to the SCP school of antitrust policy the airline industry result would not likely occur. Those who hold the SCP view focus primarily on price as the measure of competition and social welfare rather than non-price competition and secondarily, have a view of business conduct or behavior that is apparently inconsistent with the reality of the business world. Apparently, the competitive forces are much stronger than anticipated by academic economists and the legal community[24].

Could it be that only a few firms in a few city-paired markets caused the unexpected findings of normal rates of return? It appears that all of the trunk airline carriers in all city-paired markets, where they did not have complete monopoly, engaged in capacity competition resulting in falling load-factors.

Apparently capacity competition became so great that the airlines attempted to find a way to put a stop to it and to improve their economic conditions. In 1971 United, American and TWA airlines requested permission from the CAB to come to an agreement to stem the flow of blood. They asked permission to reduce capacity on fifteen (15) long-haul markets by 10 to 15 percent.

Eventually the CAB agreed and the airlines reduced capacity but only on four (4) routes. They could not come to an agreement to reduce competition on the other eleven (11) long haul routes even though, for all practical purposes, the CAB suspended all antitrust constraints on the airlines. Miller characterizes the strength of the competitive spirit in the airline industry as follows:

"As justification for their agreement, the three carriers argued that the temptation for carriers to add additional capacity [eroding economic profits] in attempting to increase market share is too great, and thus carrier system capacity and resulting load factors are beyond the control of individual carrier management. Accordingly, the industry is characterized by a hopeless spiral of excess capacity, the only solution being multilateral control, monitored by the Board.[25]"

In conclusion, the history of the regulation of the U.S. passenger airline industry provided an almost perfect experiment to test the theory that firms in very concentrated markets, selling a homogeneous product or services, will collude with respect to price or output resulting in monopoly. Even with the encouragement of the federal government and with exemption from the Sherman Act, the airlines continued to engage in vigorous non-price competition by adding flights until potential economic rents were eliminated. When the airlines were de-regulated in 1979 most were earning normal, and in some cases below normal, rates of return. Thus, I have serious doubts that taxpayers' money is being well spent by the Department of Justice and the Federal Trade Commission with regard to their efforts to enforce antitrust laws to prevent, or limit mergers in private markets where firms do not have legal barriers to entry like the airline industry had.

AUTHOR'S NOTE

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ENDNOTES

[1]   See, e.g., Andrea Agathoklis, 'In Their Own Words: Predicting Enforcement Under Varney and Leibowitz' Summer (2009) Antitrust, 5, 12 (predicting that 'one should expect [federal regulators in the Obama administration] to enforce the antitrust laws aggressively at every opportunity'); Sean Gates, 'Obama's Antitrust Enforcers: What Can We Expect?' (April 2009) Antitrust Source, 1, http://www.abanet.org/antitrust/at-source/09/04-Gates-28f.pdf (predicting that '[i]f their records are an indication', new appointees to lead antitrust regulatory agencies 'will likely lead a resurgence of antitrust enforcement in both the conduct and merger areas'); John R. Wilke, 'Internet Law Expert is Nominated as Antitrust Chief' *Wall Street Journal* (23) Jan. 2009) A3 (stating that new appointees 'are known to favor aggressive enforcement and would mark a change from the Bush administration's approach').

[2]   George W. Douglas and James C. Miller III, Economic Regulation of Domestic Air Transport: Theory and Policy (The Brookings Institution, 1974), p. 189.

[3]   Ibid, p. 112

[4]   Ibid

[5]   Ibid. p. 41.
        [a] Including tax.

[6]   Ibid. p. 42-43.

[7]   Ibid. p. 113.
[a] A market is considered competitive if no one carrier has over 90 percent of the traffic in that market.
[b] Fiscal year
[c] Northeast merged with Delta on August 1, 1972.

[8]   Ibid. p. 91.
        [a] Defined as net profit after taxes but before interest payment on debt as a percent of equity-plus-long term debt; excludes investment tax credits.
        [b] Includes operations in Alaska and Hawaii as well as the other forty-eight states.
        [c] Not computed due to smallness of base.
        [d] Includes domestic operations of Pan American World Airways.

[9]   There appears to have been an unusual amount of agreement among economists during this period, that market rivalry was significant and center on taking price as a given and competing via cost increasing scheduling of additional flights, all of which resulted in an equilibrium whereby airlines average load factors reached the break-even level. These studies and authors are as follows: Arthur De Vany, "The Economics of Quality Competition: Theory and Evidence on Airline Flight Scheduling" (University of California, Los Angeles, Department of Economics, c. 1969; Joseph V. Yance, "Nonprice Competition in Jet Aircraft Capacity," *Journal of Industrial Economics*, Vol. 21 (November 1972), pp. 55-71; George C. Eads, "Competition in the Domestic Trunk Airline Industry: Too Much or Too Little?" in Almarin Phillips (ed.), Competition and Regulation (Brookings Institution, 1974); Anthony H. Milward, "Wasted Seats in Air Transport: An Examination of the Importance of Load Factor," *Institute of Transport Journal* (May 1966), pp. 345-62; and Lawrence J. White, Quality Variation When Prices Are Regulated," *Bell Journal of Economics and Management Science,* Vol 3 (Autumn 1972), pp. 425-36.

[10]   Douglas and Miller, pp. 42-44.

[11]   Ibid, p. 44

[12]   Donald F. Turner, "The Definition of Agreement under the Sherman Act: Conscious Parallelism and Refusals to Deal," Harvard Law Review 75 (February 1962).

[13]   Joe S. Bain, "Relationship of Profit Rate to Industry Concentration: American Manufacturing, 1936-1940," *Quarterly Journal of Economics* 65 (August 1951, pp. 293-324.
[14]   H. Michael Mann, "Seller Concentration, Barriers to Entry, and Rates of Return in Thirty Industries, 1950-1960," *Review of Economics and Statistics* 48 (August 1966), pp. 296-307.

[15]   Leonard W. Weiss, "The Concentration-Profits Relationship and Antitrust," in Harvey J. Goldschmid, H. Michael Mann, and J. Fred Weston, eds., *Industrial Concentration: The New Learning* (Boston: Little, Brown, 1974), pp. 184-233

[16]   F. M. Scherer, "The Causes and Consequences of Rising Industrial Concentration," Journal of Law and Economics 22 (Chicago: University of Chicago Press, April 1979), pp. 191-208.

[17]   George J. Stigler, "A Theory of Oligopoly," *Journal of Political Economy* 72 (Chicago: University of Chicago Press, February, 1964), pp. 44-61.

[18]   Sam Peltzman, "The Gains and Losses form Industrial Concentration," *Journal of Law and Economics* 20 (Chicago: University of Chicago Press, October 1977), pp 229-63.

[19]   Horizontal Merger Guidelines, U.S. Department of Justice and the Federal Trade Commission, August 19, 2010.
[20]   Ibid, p. 19

[21]   Carl Shapiro, " Merger Guidelines: Hedgehog to Fox", *Antitrust Law Journal*, Vol 77, p. 705.

[22]   Department of Justice and Federal Trade Commission Horizontal Merger Guidelines, Section 2.1.3, Types of Evidence, 2010.

[23]   Normally firms that engage in behavior that does not maximize stockholder wealth (market share maximization in this case) would face the constraint of the market for corporate control. In the case of the domestic passenger airline industry the "take-over" market was short-circuited because non-airline firms were not permitted to purchase controlling interest in a regulated airline.

[24]   It is interesting to note that the regulation of the common carrier trucking industry was very similar to the airline industry with blocked entry and price set above costs however they were earning economic profits prior to deregulation in 1980. Apparently the nonprice competition did not break out in this industry. Trucking firms were constrained by law from adding capacity by scheduling addition trucks between cities. Availability of service improved significantly in the trucking industry after deregulation indicating that trucking firms did not compete on this attribute of business prior to deregulation. See Thomas Gale Moore, "Rail and Trucking Deregulation," in Leonard W. Weiss and Michael W. Klass (eds.), Regulatory Reform: What Actually Happened (Boston: Little, Brown, 1986.)

[25]   Douglas and Miller, *Supra* Note 12. P. 131.

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IMPACT OF AUTOMATED RESPONSE SYSTEMS ON STUDENTS' PERFORMANCE IN PRINCIPLES OF MICROECONOMICS

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ABSTRACT

In this paper we examine if automated response systems (ARSs) improve the exam performance of students when introduced as part of active learning assignments in Principles of Microeconomics classes. Active learning assignments are designed to improve student engagement and interaction during classes and thus improve the grades of students. However, ever increasing class sizes make it more complicated to get every student to participate in these assignments. The use of the ARS allows us overcome the problem of increasing class sizes. We show that the use of ARS as part of active learning assignments lead to higher exam scores.

INTRODUCTION

While higher education administration pushes colleges to ever increase class sizes, research in economic education challenges economics instructors to move away from pure chalk and talk lectures and give more individualized attention to every student in the classroom by introducing more active learning assignments (Becker and Watts 2001). Active learning strategies are being promoted because they improve the levels of participation, peer instruction, satisfaction with the learning experience, student attitudes, and engagement in general (Armbruster et al, 2009; Johnson et al., 1998; Marbach-Ad et al., 2001; Prince, 2004; Preszler et al., 2007; Yamarik, 2007)

In recent years, automated response systems (ARSs) have become a widely used tool to address the challenges of implementing active learning in large classrooms. With an ARS all students can respond to questions posted by the instructor and receive immediate feedback about their level of understanding; using this system also provides the instructor with the possibility to identify potential areas of weakness and immediately review these areas in class. Many studies show that ARSs positively affect student attitude and student engagement (Elliott, 2003; Ghosh and Renna, 2006 ,Duncan, 2006; Freeman and Blayney, 2005; Kay and LeSage, 2009; MacArthur and Jones, 2008; Wood, 2004, Lucas, 2009; Evans et al, 2008).

While active learning has been shown to improve exam scores (Dickie, 2006; Doorn and O'Brien, 2007; Emerson and Taylor 2004; Hake, 1998; McCarthy and Anderson, 2000; Nguyen and Trimarchi, 2009; and Salamonson, Andrew, Everett, 2009), research findings on the impact

of ARSs on the grades of students are mixed: some authors find that an ARS technology improves the grades of students, while others do not find any effects.

In our study we continue this important research and contribute to the literature by using an ARS over the course of the entire semester to allow students to get comfortable with the technology[1]; by using the ARS only with active learning assignments; by limiting the difference between control and treatment classes to ARS exclusively; and by tracking the ARS impact over several exams during the semester. As a result, we are able to provide a unique way of showing the effectiveness of an ARS as a teaching tool for improving students' grades.

ACTIVE LEARNING, ARS, AND GRADES

The term "active learning" summarizes the methods of active student engagement in the class. Since active learning methods address different learning styles of students and help students to take ownership of material covered in the classroom, several authors have suggested and shown that active learning over the course of an entire semester positively influences the exam scores of students (Dickie, 2006; Doorn and O'Brien, 2007; Emerson and Taylor 2004; Hake, 1998; McCarthy and Anderson, 2000; Nguyen and Trimarchi, 2009; and Salamonson, Andrew, Everett, 2009).

While active learning methods have shown to improve teaching outcomes, these methods can be rather challenging to implement. One major challenge is getting all students in the classroom involved: effective active learning relies on engaging everyone in the classroom, while growing class sizes make it next to impossible to engage everyone in the classroom.

ARS

An ARS provides a solution to the problem of introducing active learning strategies in large classroom settings. An ARS is a device that usually looks like a remote control. Each student receives such a remote control to answer questions during class. The answers are submitted to a receiver, which is connected to the classroom computer. Each ARS has a unique number to identify the responses of each student. Responses are saved in a spreadsheet together with students' names and ARS numbers. Once students submit their answers, the cumulative results together with the correct answer can be displayed on the classroom computer screen. The responses of students can then be used as a starting point for the review of material.

Beatty (2004), Judson and Sawada (2002), and Caldwell (2007) show that ARS make it possible to transfer active learning methods from small classrooms to large classrooms. Thus, an ARS allows instructors to "interact" with every student in the classroom, and all students now receive instant feedback for their responses to the active learning assignments.

Generally ARSs are also viewed as helpful tools for achieving the goals of active learning through increasing the levels of interest, interaction, and concentration among students (Elliott,

2003; Ghosh and Renna, 2006). Furthermore, recent research shows that the use of ARSs increases student collaboration, encourages anonymous responses, improves attendance, and encourages peer instruction (Duncan, 2006; Freeman and Blayney, 2005; Kay and LeSage, 2009; MacArthur and Jones, 2008; Wood, 2004, Lucas, 2009; Evans et al, 2008).

While consensus exists about the positive effects of ARSs on student collaboration, attendance, and peer instruction, there is a lack of consensus about the effect of ARSs on grades No statistically significant improvement of grades through the use of ARSs was observed by Bunce et al. (2006), Johnson and Robson (2008), and Paschal (2002). On the other hand studies by Ball et al. (2006), Crossgrove and Curran (2008), Hall et al. (2005), Kennedy and Cutts (2005) and Lucas (2009) show that the use of an ARS improves the performance of students on exams.

Our study differs from these papers in the way we can directly link changes in grades to the use of the ARS. Treatment and control classes in our study use identical active learning assignments and classes only differ by the use of the ARS. Furthermore, we control for a wide range of student characteristics when analyzing the impact of the ARS on exam scores. Thus, this approach allows to identify the impact of ARSs on students' exam scores more clearly than previous studies. Finally, our paper will contribute to the general literature by producing additional quantitative results about the effect of ARSs on students' exam scores and document the use of ARSs in economics. In addition, this study is unique among research about the effectiveness of ARSs in economics in the number of classes that are included and its focus particularly on the ability of ARSs to enhance the effect of active learning assignments during class.

STUDY METHODOLOGY AND DATA

The study was performed in several sections of Principle of Microeconomics classes at a regional public university in the Midwest of the United States. The class is mandatory for Business and Economics majors, it is part of the curriculum of several other social science majors, and it can be used as a social science general degree requirement for other majors on campus. The objective of the study was to determine if the use of ARSs would positively affect students' exam scores.

The instructor in this study used an ARS called iClicker™ to enhance active learning assignments during 75 minute classes, which were separated into two periods of about 20-30 minutes, followed by 5-10 minute long active learning assignments. During each of these active learning assignments students were given a situational problem with several comprehensive questions that could be answered in a multiple choice format. Once all answers were submitted with the help of the ARS, the percentage of multiple choice variants together with the correct answer were displayed. If not all students answered the questions or students struggled with the assignment, the time limits for the assignment were extended. However, a timer was used for

each assignment to stay within the time limits of classes. The instructor then reviewed correct and incorrect answer options, depending on the percentage with which each answer option was selected by the students. Therefore, in the classes where ARS was used the students received a targeted and focused review based on their individual response, whereas in the classes without ARS a few students were asked to present their results in front of the class and a more general review of the assignments was provided.

The study was performed during three semesters: Spring 2008, Fall 2008, and Spring 2009. Each student who was part of this study took three exams. Scores from each exam were used to evaluate the effectiveness of the ARS. During the study the professor, the course content, the grading scale, and the course assignments stayed the same. Measures were taken to prevent course assignments from becoming public knowledge.

Students were randomly assigned into treatment (ARS use) and control classes (no ARS use). Both groups did the same active learning assignments during classes. The treatment group had the possibility to respond to the active learning assignments using the ARS, whereas in the control group only a few students had the possibility to respond to the posed question. Before selecting classes students were not aware of the use of ARS during class.

A total of 220 students took part in the study. The treatment group consisted of 105 students and the control group consisted of 115. The majority of students in the classes were Freshmen (32%) and Sophomores (33%), with a mean ACT[2] (American College Testing) comprehensive score of 20.7 and a mean ACT math score of 21.2. However, ACT scores were only available for 154 students. Students in the sample were 61% male and 49% of the students were registered as Business or Economics Majors/Minors. The control (no ARS use) and treatment (ARS use) groups were randomly selected; however, students voluntarily entered in classes, so it was not possible to randomly assign students to control and treatment groups. Thus, the data was carefully analyzed to detect possible biases among the two groups. Students in the control group had statistically significant higher ACT math scores. Furthermore, in the treatment group 40% of the students were sophomores and 15% junior, while in the control group 26% of the students were sophomores and 32% juniors. There were no other statistically significant differences among the treatment and control group. See Table 1 for further information.

Table 1: descriptive statistics				
	Variable description	Percent	Mean	Standard Deviation
Dependent Variables				
Exam 1	Percentage Score of Exam 1		67.97	13.96
Exam 2	Percentage Score of Exam 2		73.43	14.57
Exam 3	Percentage Score of Exam 3		58.70	16.67
Independent Variables				
HWComp	Percentage of Homework Assignments Completed by each Student		91.89	14.3

Table 1: descriptive statistics				
	Variable description	Percent	Mean	Standard Deviation
BusEcon	Dummy variable Business of Economics Major/Minor = 1		0.493	0.50
ACTComp	ACT - American College Testing Comprehensive Score		20.74	3.72
ACT Math Score	ACT - American College Testing Math Score		21.21	4.33
Gender	Male = 1, Female = 0		0.58	0.50
SLevel	Level of Studies; Freshmen = 1, Sophomores = 2, Juniors = 3, Seniors = 4, others = 5		2.06	1.04
Freshmen		32.27%		
Sophomores		32.73%		
Juniors		24.09%		
Seniors		8.18%		
Others		2.73%		

EVALUATION

The objective of this study is determining if the use of ARSs in the classroom improves student performance on exams as determined by grades. Other research has looked at the relationship between ARS and exam performance; however, this study is unique in its length (three semesters) and its focus directly on using ARS as part of active learning assignments only. This study provides a unique perspective on the effectiveness of ARS, because the ARS is the only difference between the treatment and control group classes. The impact of an ARS on exam performance is tested by applying an educational production function setup (Hanushek, 1979). The approach from Hanushek suggests that student performance is affected by background (GENDER, LEVEL OF STUDIES), motivation (HOMEWORK COMPLETION, MAJOR) and ability (ACT). We use the log of percentage exam scores of students from three separate exams as the dependent variable for the study and estimate the following function:

log(exam scores) = f (ARS, log(HOMEWORK COMPLETION, GENDER, MAJOR, LEVEL OF STUDIES, ACT SCORES))

We use a standard OLS regression to estimate the educational production function. We expect to find a positive correlation between the general ability level of students (ACT) and examination scores. Furthermore, following the literature (Ballard and Johnson, 2005; Walstad and Robson, 1997), we expect to find that female students have lower exam scores than their male counterparts; we expect the sign on our gender variable to be positive (gender dummy male=1). Furthermore, it may be possible that students develop better study and test taking strategies as they have taken more classes. Thus, we would expect the sign of level of studies coefficient to be positive. However, it is possible that students may participate in the class at a later stage (junior/senior year) of their university career if they are not interested in the class and

take the class to fulfill a general education requirement. Thus, the potential lack of interest might cause the level of studies coefficient to be negative. Hence, we might have two opposing influences, ultimately causing the coefficient to be insignificant altogether. Furthermore, it is likely that students who are enrolled in a business/economics major/minor exercise more effort and thus have higher exam scores. The positive influence of a students' major/minor on exam scores might also be caused by simple selection. Students who know their academic performance in Principles of Microeconomics will likely be strong, are more likely to enroll into a Principles of Microeconomcis, because they expect to get better grades; this then leads to a positive coefficient on the major/minor. Therefore, we expect the sign of the major/minor coefficient to be positive. Finally, we expect examination scores to be positively correlated with homework completion rates. This effect might either result from a practice effect or simply identify students who are more engaged and interested in course content. Due to university regulations no additional explanatory variables were available to the researchers.

The results for the estimation can be found in table 2. Overall the results suggest a mild positive effect of using ARSs on students' grades. We only find a statistically significant positive effect of the ARS on scores of the final (third) exam. Students in the treatment group have 5% higher scores in exam 3 compared to students in the control group. This result is significant at the 99% level[3]. We suspect that it took some time for students to appreciate the immediate feedback the ARS provided. It is possible that the use of an ARS causes students to alter their study behavior over time and thus the ARS use does not immediately have an effect on exam performance.

In addition to the ARS findings, our results show that ACT scores are positively correlated with performance on exams in economics. This result is significant at the 99% level for all three regressions. A one point increase in ACT scores is related to a 1.6% to 2% higher scores in exams. Moreover, we find with a significance level of 99% that students homework scores are positive related with exam scores: increase in the HOMEWORK COMPLETION rate by 1% is related to an increase in exam scores by 0.16 to 0.26%. Different to other studies in economics classes (Johnson and Robson, 2008; Ballard and Johnson, 2005; Walstad and Robson, 1997), we do not find that female students perform worse than male students in this study. Furthermore, it does not appear that MAJORS IN BUSINESS OR ECONOMICS perform better in exams. Finally, the results show that one extra year of schooling (LEVEL OF STUDIES) is positively correlated with performance on exam 2. The coefficient for level of studies is significant at the 95% level.

We use a variety of interaction terms of students' characteristics and the ARS dummy to determine if the rate of HOMEWORK COMPLETION, the GENDER, the MAJOR of the student, or the LEVEL OF STUDIES influences the impact of ARS on exam scores. Using these interaction terms, we find that the effectiveness of ARS is not influenced by student characteristics.

Table 2: OLS Regression Results			
	Exam 1	Exam 2	Exam 3
ARS	2.051 (1.08)	-2.094 (-0.98)	5.301** (2.33)
HWComp	0.169** (2.82)	0.261** (3.87)	0.234** (3.26)
BusEcon	1.142 (0.60)	-0.016 (-0.01)	-0.857 (-0.38)
ACTcom	1.642** (6.38)	1.717** (5.90)	2.000** (6.45)
SLevel	1.201 (1.32)	2.061* (2.00)	1.752 (1.60)
Gender	2.125 (1.11)	2.001 (0.92)	1.111 (0.48)
Constant	12.594 (0.385)	8.090 (0.83)	-11.840 (-1.15)
N	154	154	154
Adj R-square	0.222	0.240	0.244
F-test (p-value)	0.000	0.000	0.000
Breusch-Pagan (p-value)	0.733	0.619	0.314

Note: Parentheses contain t-values; dependent variables are logarithms of percentage exam scores; F-test H0: all of the model coefficients are jointly = 0;Breusch-Pagan test for heteroscedasticity H0: constant variance; Significance level is indicated * = 5%, and ** = 1 %

Clustering of standard errors by classes did not alter results; using White's heteroscedastic-consistent standard errors did not drastically alter results; using a SURE setup did not provide further insights

CONCLUSION AND DISCUSSION

In this study we evaluate the effectiveness of implementing an ARS as a teaching tool in Principles of Microeconomics classes. We use ARSs to accompany active learning assignments during lectures. Generally, the literature on active learning has shown that active learning assignments benefit students, but it can be hard in large classrooms to get every student to participate in active learning assignments. An ARS allows instructors to overcome problems of participation and engagement.

We find that the use of an ARS positively affects students' exam scores. Therefore, we show that ARSs are an important addition to active learning assignments in large classrooms. However, the positive effect of the ARS was not observed until the third exam of the semester. Thus, it is likely that students need a certain period of time to get used to the changed mode of instruction. Students may need time to benefit from the ARS because they may not be used to such a direct interaction during class and may need to adapt their learning styles to fully benefit from this new teaching format. Thus, even though the benefits from ARS take time to be realized through improved exam scores, in the end, introducing this technology into the classroom paid off. Hence, the research presented in this paper is an important addition to the existing literature

on the use of ARS, since it provides insights into the use of ARS in economics and further supports for the positive impacts of ARS.

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ENDNOTES

[1]   None of the students that participated in this study had every taken a class that used an ARS

[2]   College entrance exam with a max score of 36

[3]   It needs to be taken into account that the average score for exam 1 and 2 was much higher than the average score for exam 3 and that the standard deviation of scores for exam 1 and 2 was higher than for exam 3.

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OPPORTUNITY IN FAILURE: ADDING "I&E" TO INTRODUCTORY ECONOMICS

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ABSTRACT

In this note, I contend that the subjects of innovation and entrepreneurship (I&E) need to be included in the introductory economics curriculum, and I propose a specific strategy for including them. I argue that it can be both practical and effective to add these subjects to the curriculum by bringing them into the discussion of market failures. Entrepreneurs see market opportunity where economists see market failure, and their market solutions to market failures are often instructive. The "opportunity in failure" perspective can add a new dimension to the introductory economics curriculum while taking the much overdue step to include the subjects of I&E. Additionally, this modification provides an opportunity to enrich the introductory curriculum with the Austrian perspective. A number of references are provided to help guide instructors in their specific implementation of this proposal.

INTRODUCTION

There have been many calls to bring the undergraduate economics curriculum up to date in several respects. In particular, the introductory microeconomics course is especially in need of reform. (Not all agree—see, for example, the comments in (Mankiw, 2009).) For many college students, it is the only economics course they take, and it is therefore an important vehicle for economists to make an impact on the general understanding of economics (Becker, 2000). Economic theory has progressed substantially in the past few decades, and there are new and well developed areas of theory that have yet to make a serious impact on the undergraduate introduction to economics (Ferguson, 2011). One important topic that has been recognized as a glaring omission in introductory courses is that of entrepreneurship. Though it has long been recognised as a major driver of economic growth, it is still only marginally treated in most economics textbooks (Kent & Rushing, 1999). It is telling that a major recent collection addressing the future of the economics curriculum (Colander & McGoldrick, 2009) does not contain the words "entrepreneurship" or "innovation" in its index, and none of its twenty-three chapters (all by different authors) address those subjects. The omission has persisted even as the economics of entrepreneurship has become a well established field of academic research (Parker, 2009).

The relegation of innovation and entrepreneurship (I&E) to the sidelines in introductory economics is detrimental in at least two ways. First, students' understanding of how a market economy works is necessarily limited when innovation and entrepreneurship are not included in

a serious way. Second, students' views of the economy and economics become tilted towards seeing the economy either from the perspective of an outside observer, or the perspective of a government policy maker. The first of these is reinforced by the conscious focus of economists on "positive" economics. Even the second perspective encourages a static view of the economy as a system in equilibrium that can be subjected to various policies and moved to new equilibria. The missing perspective of the entrepreneur or innovator looking for opportunities is arguably the most important one in the economy.

In their discussion of the direction the economics major has taken in the past one or two decades, (Colander & McGoldrick, 2009) point out that economics curricula have traditionally been developed for the student who pursues graduate study in economics, but only a very small percentage of economics majors do that. Thus, even amongst economics majors, the vast majority of students are "generalists." They write: "Economics faculty are teaching students to think like economists, but it is not clear that "thinking like an economist" is the appropriate educational goal for these generalist students. Instead, for them, the goal should to be to develop their ability to use broader reasoning tools in ways that are consistent with the economic way of thinking." The present proposal to bring the entrepreneurial perspective to discussions of market failure does just that.

The fundamental, even defining features of developed market economies are innovation and entrepreneurship (Baumol, 2002; Baumol, 2010; Schumpeter, 1942). The clash between the change inherent in innovative, entrepreneurial economies and the models in introductory economics becomes especially apparent in the discussion of so called "market failures." While we, economists, describe these phenomena as failures, entrepreneurs have seen them as opportunities and have provided solutions while taking advantage of these opportunities.

This proposal offers a strategy for adding substantive discussions of innovation and entrepreneurship to the introductory economics curriculum through turning discussions of market failure towards the entrepreneurial perspective. This strategy can be implemented with fairly minimal changes to the structure of the introductory course. In addition to enhancing the coverage of I&E in the course, it also provides an opportunity to enhance the treatment of market failures. While each instructor can use the ideas presented herein to suit his or her approach to the introductory economics course, I have found that this strategy can be implemented most successfully if a discussion of Austrian ideas on entrepreneurship occurs early in the course. Such a discussion has the added advantage of bringing a heterodox perspective to the typical, mostly neoclassical introductory economics course. With appropriate modifications, this proposal can be adapted to higher level economics courses as well.

AUSTRIAN PERSPECTIVES

Though a substantial part of the typical introductory economics course is devoted to explaining how the market might fail, very little of it is devoted to how the market works. A

module on the Austrian perspective could partially rectify this through its focus on the *market process*, on *entrepreneurship*, and on *information dispersion and discovery*. (Egger, 2008) discusses how Austrian economics can be incorporated into the principles course, and points out that the Austrian perspective is in many ways very much consistent with the standard approach to introductory economics. In fact, (Colander, 2010) points out that important contributions of the Austrian school have more or less become accepted in mainstream economic thought. (Kirzner, 1997) provides a succinct discussion of an Austrian approach to microeconomics, and can be used as background reading. A module introducing basic notions of entrepreneurship and innovation can be presented, of course, without turning to the Austrian school. There may very well be additional value in introducing students to the Austrian perspective, but any introductory discussion of entrepreneurship and innovation will serve as preparation for the new material proposed below on market failure.

The classic work on entrepreneurship is (Kirzner, 1978). A concise summary of Kirzner's view of the entrepreneur and its comparison with Joseph A. Schumpeter's view can be found in (Kirzner, 1999), and can be assigned as supplemental reading. A more in-depth analysis of the Kirznerian entrepreneur and its place in the Austrian school is given by (Foss & Klein, 2010), who also include an introduction to Austrian ideas. Kirzner explored the role of entrepreneurship in the economy rather than study the practice of entrepreneurship, and this places the domain of his analysis squarely in microeconomics. The distinguishing characteristic of the Kirznerian entrepreneur is *alertness*. Through discovering and profiting from opportunities, entrepreneurs move the economy towards equilibrium. In courses that include market simulations, students will be able to connect these ideas directly with their own experiences with participating in a market. In general, any economic agent may take on the role of the entrepreneur, though some specialise in entrepreneurial activity.

The discussion of Kirznerian entrepreneurship complements very well the standard treatment of supply, demand, and equilibrium. Though it is often claimed in introductory courses that a market in disequilibrium will tend towards equilibrium because of surplus or shortage, it is well known that there is no convincing theoretical support for general convergence to Walrasian equilibrium. The details of the *process* of how a shortage or surplus would move price to equilibrium are left unexplained even in the simple one-market case. Introducing the notions of entrepreneurial alertness and discovery will give students one view of such a process, even if it is not a rigorous view. A more advanced course might additionally discuss the relationship between Kirznerian entrepreneurship and rigorous models of trading through intermediaries, such as (Blume et al., 2009).

In addition to consideration of the topics of entrepreneurship and the market process, the informational efficiency of the free market system should be explored in a basic overview. The allocative efficiency of the market system is strongly emphasized in introductory courses, but it is not difficult to show students that finding an efficient allocation could easily, perhaps more easily, be done in a centralized way. In fact, when students complete a market simulation, *they*

often calculate, as part of their assignment, an efficient allocation in order to compare it with the experimental outcome. The decisive advantage of the competitive market may actually be found in its *informational* properties. This idea goes back at least to (Hayek, 1945), which is appropriate supplemental reading for introductory (or more advanced) courses. A more rigorous course can follow the line that started with (Hayek, 1945) through the more formal work on communication complexity (Hurwicz, 1977; Mount & Reiter, 1974) all the way to the very general results of (Segal, 2007).

Whether it emphasizes the Austrian perspective or not, the module on entrepreneurship, the market process and information can be as short as one or two classes, or it can be a substantial new topic within the course. In addition to supplemental readings mentioned above, chapters from (Baumol, 2002) or (Baumol, 2010) are appropriate even at the introductory level.

MARKET FAILURE AS OPPORTUNITY

The typical introductory microeconomics course gives students a solid grounding in supply-demand analysis and surplus analysis to demonstrate the optimality of markets, and then proceeds to discussions of "market failures." These include externalities and public goods, as well as asymmetric information. It has been argued, both in particular examples of supposed market failures as well as more generally, that these failures exist more in our theories than in the economy. The book by (Spulber, 2002) gives several representative examples of fictional market failures that persisted in textbooks for a long time; chapters from the book are appropriate as supplementary reading for introductory courses. More recently, (Dean & McMullen, 2007) argue for viewing market failure as entrepreneurial opportunity, and provide a typology entrepreneurial activity according to the market failure addressed. They thus propose the notions of *Coasian entrepreneurship* (providing better defined property rights), *institutional entrepreneurship* (reducing transaction costs, establishing economic institutions), *market appropriating entrepreneurship* (challenging monopoly markets), *political entrepreneurship* (challenging inappropriate government intervention), and *informational entrepreneurship* (discovering informational asymmetries, enhancing information).

The following proposals contain specific strategies for incorporating discussions of I&E through a more realistic and well-rounded discussion of market failures. These suggestions can be used to modify the typical introductory economics course effectively and without requiring major changes. It is not the purpose of this note to discuss the general treatment of these topics in introductory economics courses, so the focus will remain on proposed changes. As readers are likely to be familiar with the relevant basic notions in economics, these notions will be used without definitions.

Externalities

The notion of externalities illuminates for students phenomena which they are deeply familiar with. Using the notion of *external cost*, the damage on third parties can be placed into the supply-demand framework. The deadweight loss then identifies the failure of the market. This subsection opens with the problem of externalities, because it is the one subject where a version of the present proposal is already common practice. In particular, the lesson of the Coase Theorem is that private initiative can resolve the failure of the market mechanism when transaction costs are low and property rights are well defined. Students are encouraged to think about innovative ways to resolve conflicts, ways to reclaim the value lost to market failure. As an important part of the unit on externalities, various government interventions aimed at correcting the market failure are typically discussed and evaluated.

Pointing to the opportunities for potential gains from private negotiation, as the Coase Theorem does, is valuable, but only half the story. Entrepreneurial alertness and action (using Kirzner's terms) are needed to take advantage of such opportunities. In addition, transaction costs or poorly defined property rights can prevent private solutions to externalities, and lowering such transaction costs or innovative solutions to better defining property rights represent opportunities for entrepreneurs. (Dean & McMullen, 2007), who focus on environmental entrepreneurship, point out that class action lawsuits can be seen as entrepreneurial responses to situations where high transaction costs and collective action problems would otherwise prevent private resolutions to externality problems. They also describe the example of Richard Sandor's Chicago Climate Exchange, which can be used to illustrate how entrepreneurial action can address environmental problems (see also Sandor, 2002).

The more common approach to environmental problems is regulation by government agencies. These regulations often have interesting (and sometimes unexpected) effects on innovation in the affected industries. The analysis of incentives to innovate can be brought into the introductory economics curriculum through the study of these effects of environmental regulation. The Porter Hypothesis (PH) states that environmental regulation of an industry can, in fact, make it more efficient, more profitable and more competitive globally. (Porter & Linde, 1995) give several specific examples of this, and also review critical responses to the PH. (Lanoie et al., 2011) test three versions of the PH empirically, and they find strong support for a weak version of the PH. The effects of environmental regulation on innovation are complex and still not well understood, while growing in importance. Some recent studies survey the state-of-the-art (Hemmelskamp, 1997; Kemp, 2000), and a course with a strong emphasis on environmental regulation could draw on this literature.

There is another aspect of the problem of optimal regulation that connects it with Austrian ideas and the study of innovation. Often environmental regulation is meant to force industries to invest in pollution-reducing innovation. That is, regulators understand that they may not be aware of some attainable outcomes, and they rely on innovation by the regulated industry

to uncover such possibilities in reducing pollution. This gives firms in the regulated industry some power to shape the regulation they will be subject to, and they sometimes use this power strategically either to lighten the regulatory burden and hold back innovation, or to gain a cost advantage against rival firms and invest heavily in innovation (Puller, 2006). The importance of "complete ignorance," or unawareness, in the economy is often emphasized by Austrians, as is innovation.

Information issues

Introductory texts emphasize the importance of the assumption of perfect information in competitive markets, and the inefficiency that results from asymmetric information. This neoclassical treatment makes two important omissions. First, it fails to shed light on the *market process*, which the Austrian school has emphasized. Kornai, though not an Austrian, compared "the pale category of competitive equilibrium to relations between a frigid woman and an impotent man" (Kornai, 2006, p. 190). Second, it leaves the student with the impression that information asymmetry will inevitably lead to market failure. In fact, information asymmetry is pervasive, and often leads to market opportunity. We address both of these points below.

The market process can be well illustrated by an in-class experiment, where students simulate a market (see, for example, Chapter 1 or 2 in Bergstrom & Miller, 1999). The process of communicating bids and asks in an oral double auction demonstrates that convergence to equilibrium is a result of information sharing motivated by individual gain. This can be a good foundation for the subsequent discussion of asymmetric information, and can be followed by an in-class experiment simulating the lemons market (see Chapter 12 in Bergstrom & Miller, 1999). It also emphasizes that the perfect information assumption does not imply that "everyone knows everything," and participants in a market hold private information that the market process eventually aggregates into equilibrium prices (Kirzner, 1978). With or without an in-class market simulation, a discussion of the information aggregating role of prices should preface the unit on asymmetric information. This could link back to the introduction to Austrian ideas early in the course, as discussed in section 2.

The problems of adverse selection and moral hazard appear in a number of important applications, and form an integral part of today's economics curriculum. It is important for students to develop a solid understanding of these phenomena, especially as they often appear in the popular press. However, it would also be important that students learn to see these problems from an entrepreneurial perspective, and that they understand how economics as a science can explain and evaluate entrepreneurial solutions that have appeared in the marketplace.

Adverse selection

A discussion of adverse selection is commonly part of an introductory course. For example, (Mankiw, 2011, p. 470) describes several examples of markets afflicted by a "hidden characteristics" problem, and proceeds to brief discussions of signalling, screening, and the possibility of government policy responses. Mankiw's approach is representative, and the leading example in most discussions is the lemons market (Akerlof, 1970). In my experience, the typical introductory economics class will have at least a few students who will be aware of used car quality certification services, which will lead them to question the relevance of the notion of "market failure." It is natural then to take the next step in analysing the used car market, and to add the possibility of quality certification to the model of the market, followed by a discussion for the market for certification services. A numerical example of breakdown in a lemons market can be expanded into a model with a quality certification market with free entry, and this market's functionality can be easily demonstrated. More subtle questions about possible information problems regarding certifiers can then be raised.

In a course with experiments, the lemons market experiment (see Chapter 12 in Bergstrom & Miller, 1999) can be expanded by allowing students to open quality certification businesses at a cost. As a first step, it is useful to assume that the quality certifiers present completely credible (costlessly verifiable) information. Students will be able to work out the new equilibrium in the market, involving an equilibrium number of quality certifiers. This simulates effective entrepreneurial response to asymmetric information problems in a market.

A broader discussion of quality disclosure (voluntary, mandated, or via third-party certification) in a variety of markets can be based on the survey by (Dranove & Jin, 2010), which is accessible to introductory economics students. This provides an opportunity to incorporate a more balanced view of government, industry, and market responses to problems of asymmetric information. It is also a natural and low-cost way to introduce mini case studies from several industries that are well known to students (health care, college choice, automobiles). (Dranove & Jin, 2010) add a historical dimension (made more relevant by the financial crisis) by pointing out that "[m]arket driven, third-party disclosure first occurred in 1909 when John Moody issued bond ratings, followed quickly by Poor's Publishing in 1916 and Standard Statistics in 1922."

Moral Hazard

Moral hazard is typically discussed with adverse selection in the introductory economics course, using the insurance market or the principal-agent model as the illustrative example. Innovation in the health insurance industry can be used to illustrate how entrepreneurs provide solutions to these problems. A new industry focused on providing health incentive programs with employer sponsored insurance is springing up and has been described in health industry trade

journals as well as the press (Hand, 2009; Lohr, March 27, 2010). RedBrick Health, one of the earliest entrants, provides programs to companies including Scotts, WelchAllyn, and Fortune 500 companies SaraLee and Cargill; other large firms, such as IBM and General Electric, choose to create their own health incentive programs.

In the economics literature, behavioural economists have studies whether health behaviour can be shaped through better incentives. (Charness & Gneezy, 2009) report on their study on exercise habits, and they show that appropriate incentives can significantly influence good habit formation. (Cawley & Ruhm, 2011) provide a comprehensive review of the economics of risky health behaviours, including extended discussions of both the more traditional approaches to these problems, as well as the more recent studies of the effectiveness of various incentives aimed at changing behaviour. The private provision of commitment mechanisms can also be relevant to discussions of moral hazard, though the subject has broader implications in behavioural economics. (Burger & Lynham, 2010) look at the weight loss betting market, while (Gine et al., 2010) report on their test of a voluntary commitment product for smoking cessation.

CONCLUSIONS

The introductory economics curriculum has yet to integrate serious coverage of the topics of innovation and entrepreneurship. While these topics are now recognised as very important in themselves, the failure to cover entrepreneurial responses to market failures in particular provides an opportunity to effectively add coverage of I&E to introductory economics courses. I proposed specific approaches to include these topics in introductory economics courses. These proposals can, however, be easily adapted for more advanced economics courses as well.

There are several reasons to add the topics of I&E to discussions of market failures. First, the tension between the efficiency of idealised markets and the inefficiency resulting from market failures is fundamental in introductory economics courses. Students learn to analyze problems using economic tools, and to make welfare comparisons using the perfectly competitive case as a benchmark. Various government interventions to correct market failures are evaluated in this way, but entrepreneurial responses based on private initiative are not emphasized. It is important to convey to students that such responses to market failures are common and can be analyzed using the tools of basic economics.

Second, I&E can be added to the introductory economics course with minimal modifications as part of the discussion of market failures. Instructors can easily add the new material to their existing courses, devoting a little more time to the topics of market failures. I referenced above a number of additional readings, many of which are appropriate even for students in introductory economics. These can be used to develop specific implementations of the proposals above to suit specific circumstances.

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STATE-CONTROLLED ELECTIONS:
WHY THE CHARADE

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INTRODUCTION

Some public choice economists and political scientists would argue that the distinction between classical elections, thought as free and competitive, and their unfree and non-competitive variants is of little importance, as both are said to rely on the manipulation of the people's will. At best, elections are relatively free and competitive. Even in the most democratic countries of Western Europe and North America, there are regularly uncontested elections and elections with more or less predictable results where certain candidates have for years had no chance whatsoever of being elected (Tullock, 1987).

Although it is not easy to define an electoral system as democratic simply by looking at the formal requirements of freedom and plurality of parties, the fact remains that there is a wide range of electoral practices in the Western Democracies. Three points constitute the most generally accepted criteria for distinguishing between classical and non-classical elections. They are freedom of voters, competition between candidates, and the effects that the elections have in government policies (Ball, 1977). Freedom of an election is judged by the voter's degree of freedom. It is indicated by the opportunity a voter has to cast his ballot free from external hindrance and to expect his ballot to be counted and reported accurately, even if it goes against the wishes of those in power.

In the criteria of competition, it is reflected through the presence of several candidates for office or, in the case of referenda, through the existence of various options offered to the voters. However, economic and legal limitations make perfect electoral competition unrealistic. The economic limitations favor parties with supporters controlling large amounts of money, thus handicapping groups which are short of such support, and legal limitations may restrict or outlaw extreme right or left wing groups, or autonomist or separatist organization judged to be dangerous to national unity.

The third criteria by which classical and non-classical elections can be distinguished is that, the control of office is normally determined by the outcome of the elections. Replacing office holders by the leaders of the opposition is possible and modifying government policies in a direction more in tune with the wishes of the electorate. The principle of alternating parties in government is the fundamental rule of the elective representative democracy. In authoritarian elections, results do not modify the control of power; power holders claim to stand above parties and electors, and elections provide only, at best, a political barometer, the readings of which don't create any obligations for the government. The rest of the paper is organized as follows:

section 2 discusses the rationality of irrational behavior whereby elections are held even though the outcome is clear to all and in advance. Section 3 models this rationality whereby dictators hold elections and the response of the captive voters. Section 4 concludes and suggests directions for further research.

STATE-CONTROLLED ELECTIONS: WHY BOTHER?

The Rationality of Seemingly Irrational Behavior: A Discussion

Non-competitive elections are not peculiar to authoritarian states alone. Elections in representative democracies are sometimes not the result of an autonomous choice on the part of voters. In the United States, within the bipartisan national party system, non-competitive elections are not rare. In some counties and towns, there is only one-party organization. Also noncompetitive elections don't have the same meaning in a complex industrialized society as they do in a predominantly peasant country, the population of which is largely homogenous and illiterate. They also have a different meaning according to the electoral history of each country. The fact that elections don't have the same meaning when they are without choice is not evidence that they lack any meaning. Instead, it is an indication that their meaning is different. Rulers who don't rely upon elections for their continuance in office can nonetheless use elections to mobilize public opinion and gain the appearance of legitimacy.

If we assume that elections are an opportunity for the citizen to express freely his preference for alternative leadership and program, the question tends to be, why elections at all when the rulers are unlikely to give up their power whatever the outcome. The assumption here is that if there are elections they must have some functions from the point of view of the leadership of the country and some consequences for the political system, and the voters must have some reason to participate in them.

Non-competitive elections provide one of the few occasions when those in power cannot avoid the public formalization of their program and ideological positions, whether real or assumed, and the revelations of their ability to mobilize mass-support. In authoritarian governments, non-competitive elections represent a necessary operation of pressure relief or mass mobilization compelling them to unveil some of their political conceptions. These elections always reveal the ruler's ideology, as well as indicating the type of relations, coercive or participatory, which the governing circles try to have with the population.

The functions of elections can be identified through four categories: Communication, education, legitimation, and internal equilibrium (Niemi and Weisberg, 1988). The communication function of the electoral process normally provides an immediate and solemn occasion for the transmission of orders, explanations and cues from the government to the population. Authoritarian leaders cannot escape the obligation of indulging in politics from time to time but they evidently do it in as directive, massive and unilateral possible. Moreover, the

government of new states where illiteracy, linguistic fragmentation and lack of regular channels are hindrances to easy communication with the people can use electoral campaigns as efficient though occasional means to reach the masses, who cannot be contacted by more permanent means.

The educational function of state-controlled elections is the paradox that, whereas the very exercise of the vote instills in citizens an awareness that they ought to have the ability to influence their rulers, it at the same time hides real inequalities of power through nominal equality at the ballot box. The educational function can change into alienation when elections are manipulated by authoritarian governments to such an extent that they may be considered no more than simple propaganda and for opposition intimidation.

The legitimation function of the state-controlled elections can take two forms: national and international. Elections are signs of good conduct to the outside world. This is true in new states, which pay homage to the former colonial powers in this way. Also internal electoral legitimation is commonly a political resource of the greatest importance in new states whose national unity is still fragile if not fictitious.

Finally, state sponsored elections reflect and influence the distribution of power among the groups that control the government. In regimes where there is no fixed term for elections, holding them is often motivated by the need to give public sanction to the rivalries of the different factions of the elite, by the wish to capture new elements whose support is sought by the rulers, or, in some circumstances by the will of those who govern to weaken the influence of traditional forces such as religious organizations.

THE MODEL

The Dictator's Utility Function

Let us assume that dictators or authoritarian rulers are rational economic persons who have a well-defined utility function. Holding an election entails both a benefit and a cost for the ruler. Let us say that the ruler maximizes the following utility function:

$U = u(C, B)$, where C is the cost of holding an election in terms of resources spent on campaigning and mobilization, and B is the benefit from election in terms of legitimacy, prestige and any other pecuniary and non-pecuniary benefits to the ruler.

$C = c(N)$; whereby $dC/dN > 0$ and N is the number of voters. The cost of holding elections is a positive function of the number of voters. $B = b(N)$; where $dB/dN > 0$. When the government gives no opportunity of freedom of expression of any opposing view, withholding one's vote is the only challenge to their power. This is especially true when abstentions and boycotting elections are on a very large scale and worse if it is concentrated in certain regions or segments of the society. In authoritarian regimes, there is a high risk associated with the loss of political power and that is what makes them expend all the efforts of unilaterally extending their

tenure in office. Actually, the turnout of the election is a signaling device about the political temperature. Once the electorate comes out to vote, they can only vote yes, and in some cases there is no box for a "no" vote at the ballot box. Therefore, a larger turnout accrues benefits to the ruler (Here, we will also assume that the ruler can imperfectly control the voter turnover through bribery, intimidation, etc.).

U = u (B-C); where B-C is the net benefit of an election. U = u [B(N) – C (N)], maximizing this with respect to N gives:

dU/dN = (dU/dB * dB/dN) – dU/dC * dC/dN = 0, solving for this equation results the following: (dU/dB * dB/dN) = (dU/dC * dC/dN). This suggests that the authoritarian ruler will hold elections to the extent that the marginal benefit from voter turnout in terms of legitimacy and prestige is equal to the marginal cost in terms of resources spent on voter turnout.

The Voter's Dilemma

It is difficult for voters under authoritarian/totalitarian regimes to express their political preferences when presented with no choice and their votes have no impact on the outcome. In most cases, votes casted against the government or political program are either ignored or used as a screening device of who is for or against the regime. Voting against the government carries a penalty, and since voters are aware of this threat, they hardly cast any negative votes. The only alternative is not to vote. As we mentioned earlier, authoritarian rulers overwhelmingly emphasize achieving extremely high levels of voter turn-out. Although higher turn-out will undoubtedly fulfill the leader's psychological need of massive public support, he will never lose an election either because of votes casted against or even because of a complete rejection of the electoral process.

The following equation characterizes the utility function of the voter.

V = v (Cnv – Cv), where Cnv is the cost associated with not casting a vote or casting the wrong vote. Cv is the cost of voting including the opportunity cost of going to the polling station. The objective of the voter under totalitarian regimes is to minimize the cost associated with voting and not voting. The cost of not voting results losing benefits such as a government job, or results a jail time, or being labeled anti-government. The decision to vote or not to vote is then determined by Cnv – Cv . If this difference is positive, voters will minimize cost by obeying the ruler and casting the vote, if on the other hand Cnv – Cv is negative, voters will be better off by not bothering to vote. There is no benefit variable in the utility function of the voter. There are no pecuniary or non-pecuniary benefits involved in voting. Voting entails only a cost for the voter.

CONCLUSION

The central concern of every political system, however its leaders are chosen, is the exercise of political authority. The authority of government reflects two complimentary characteristics: compliance with the basic political laws of the state, and voluntary consent for the institutions of government- that is, the constitutional regime. If the government enjoys popular consent and citizen compliance, it is a fully legitimate authority. If the governors find themselves without full consent and unable to get their subjects to comply with their decrees, then their authority is repudiated.

The choice facing authoritarian regimes is not how to conduct an election, but how to maintain authority. If orderly compliance with their wishes comes first, then they will turn to the civilian bureaucracy, the police, and the army, to make sure that subjects do what is expected of them. To supplement these forces, they may use the mass media and a mobilizing party to disseminate ideology justifying their rule. The control of economic resources can also be used to bribe people to do the government's bidding. By comparison, elections appear of secondary importance in making people loyal citizens. The problem is not so simple, for the most economical way to make people obey government is to have them comply of their own volition. Even though elections are not necessary to change or confirm the rulers of the country, they are nonetheless employed as a part of the complex efforts of rulers in search of popular consent needed to advance their aspirations to a fully legitimate authority. The more consent the authority has, the better its rulers can economize on the use of their limited resources for compelling compliance.

The choice facing citizens is how or whether to vote at all. In a country where elections do not determine who governs, a citizen dissatisfied with government can at best hope to remain in isolation or to rebel. The alternative is to be coerced into doing what the government wants, while nonetheless rejecting his moral consent.

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TEACHING STICKY PRICES TO UNDERGRADUATES

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ABSTRACT

In this paper we describe a simple way of conveying to undergraduates the central message of Ball and Romer's paper "Sticky Prices as Coordination Failure." For the simple framework we use, we also find an asymmetry between adjustments to decreases versus increases in the money supply, with the former, as in Ball and Romer, creating a coordination game, while the latter gives rise, in our formulation, to a game of chicken.
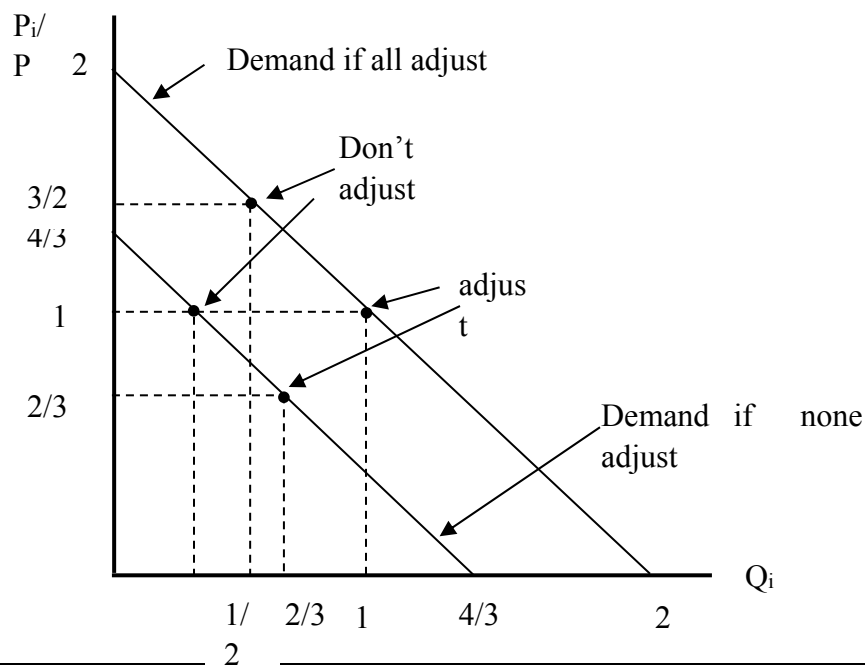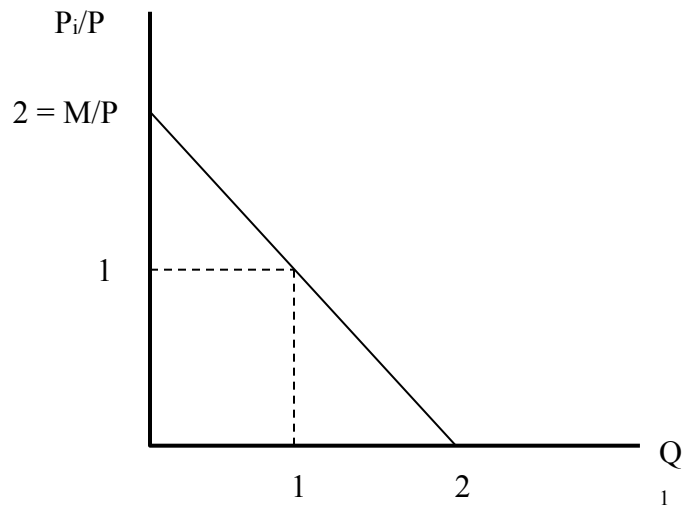
INTRODUCTION

In this paper we describe a simple way of conveying to undergraduates the central message of Ball and Romer's paper "Sticky Prices as Coordination Failure." For the simple framework we use, we also find an asymmetry between adjustments to decreases versus increases in the money supply, with the former, as in Ball and Romer, creating a coordination game, while the latter gives rise, in our formulation, to a game of chicken.

The model is simple. We have monopolistic competition with all of a large number of firms facing the same inverse demand curve of the form

$$\frac{P_i}{P} = \frac{M}{P} - Q_i$$

where P_i is the ith firm's price, P is the average price, M is the money supply, and Qi is the ith firm's quantity[1]. Firm i's sales depend negatively on its relative price and positively on the real money supply. The latter dependence can be rationalized as a real balance effect, on the basis of money in the utility function, or indirectly through the effect of real money on interest rates and interest-sensitive spending. To make things simple, we assume that firms have no variable costs, so that they maximize profits by maximizing revenue. It is then easy for students to see that the optimal relative price is ½ the vertical intercept, which in this case is M/2P; while the optimal quantity is ½ the horizontal intercept. Since we have given the inverse demand a slope of -1, the horizontal intercept is also M/P.

Since all firms are identical, the long run relative price must be 1, so the real money supply must be 2 as depicted in the graph below.

In the absence of menu costs, this equilibrium comes about as follows. Suppose we reduce M to 2/3 its former value, shifting the demand curve down and reducing the real money supply to (2/3)*2 = 4/3 so each would want to reduce his price to 2/3 of what others are charging. But as prices fall, the real money supply increases, shifting the demand curve up again. When prices are 2/3 of their former value, the real money supply is 2 again, so each will want to set a relative price of 1, and we have our new equilibrium. In the absence of menu costs, then, money is clearly neutral. Similarly, an increase in M would increase the optimal relative price above 1; prices would rise in proportion to M.

Now let's add menu costs and stick with the same reduction in M.

If none adjust, the $_{1/3}$ l firm is on the lower demand curve. Should they adjust or not i.e., is not adjusting the best response to all others not adjusting? By lowering relative price to 2/3, they would have profits of 2/3(2/3)= 4/9. By maintaining price, charging a relative price of 1, they sell 1/3 and get profits of 1/3. Thus if menu costs exceed 1/9, they do better by not adjusting, and we have an equilibrium where no one adjusts.

But now suppose that all adjust. Is this a Nash equilibrium? In this case, the typical firm is on the higher demand curve. Adjusting , which means charging a relative price of 1 given that all others have cut price by 1/3, gives them profits of (1)(1) = 1.   If they do not change price, then they will have a relative price of $P_o/(2/3)P_o$ where P_o was the price all were charging before the change. With a relative price of 3/2, they sell ½, for profits of ¾. So they will want to adjust if menu costs are less than ¼ and not adjust otherwise. There is a range of menu costs, between 1/9 and 1/4, for which we have two symmetric Nash equlibria, one where all adjust and another where none adjust. The second equilibrium, where prices are sticky, is a coordination failure. This illustrates the main message of Ball and Romer's paper in a simple framework that undergraduates can grasp.

The key to the result is that the benefits of adjusting, gross of menu costs, are greater when demand is higher. Demand is higher when all adjust then when none do. Benefits of adjusting net of menu costs may thus be negative when none adjust and positive when all adjust.

In our model, the case of an increase in the money supply is different . Suppose we have the money supply increase to 3/2 times its initial value. The graph below illustrates.
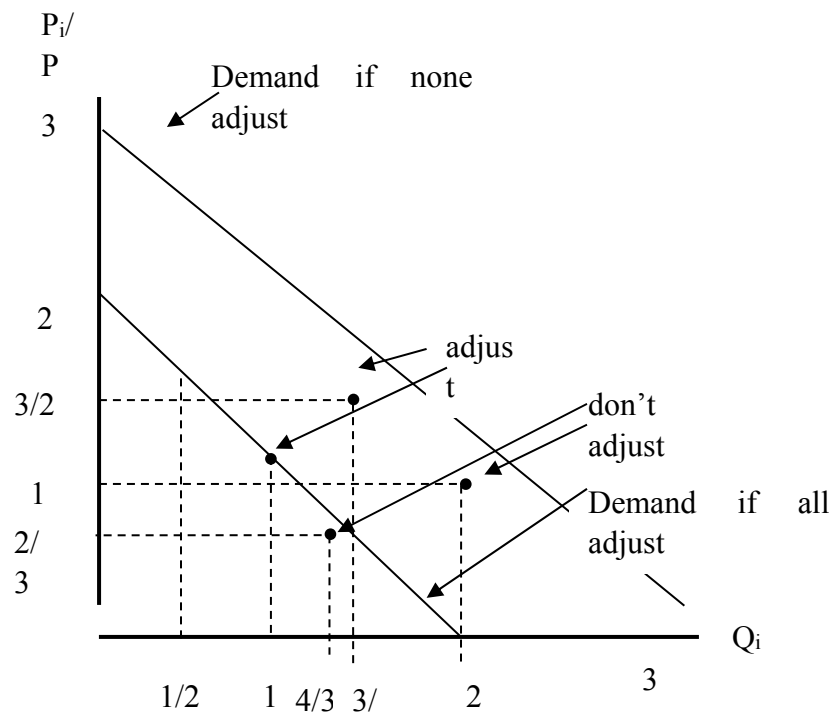
If all adjust, we are on the lower demand curve. The typical firm would have profits of 1 if it adjusts. If it does not adjust, it will have a relative price of $P_o/(3/2)P_o = 2/3$ and can sell 4/3 units for profits of 8/9. Thus it would *not* want to adjust if menu costs exceeded 1/9. In other words, if all adjust and menu costs exceed 1/9, it is *not* a best response to adjust. All adjusting is not a Nash equilibrium, therefore.

If none adjust, each firm would face the higher demand curve. Adjusting optimally requires a relative price of 3/2 for profits of $3/2(3/2) = 9/4$. Failing to adjust means setting a relative price of 1 and selling 2 units, for profits of 2. Thus if menu costs are less than ¼, each wants to adjust when other do not adjust; there is no symmetric equilibrium in which none adjust.

Instead of a coordination game, in this case we have a game of chicken. In the appendix (We generally teach this without the appendix material, although the appendix requires nothing particularly advanced.), we show that the unique symmetric Nash equilibrium has each adjusting with probability equal to $(1/MC)^{1/2} - 2$, where MC is the menu cost. Alternatively, the equilibrium has this proportion of firms adjusting, while the others do not.

It is easy to see why the two cases, decreases versus increases in the money supply, are so different. In the case of an increase in M, demand is greater, and thus the costs of sub-optimal adjustment are greater, when none adjust. For a decrease in M, the costs of sub-optimal adjustment are greater when all adjust.

It is interesting, too, that in this simple context, we get a micro foundation for the old Keynesian idea that the aggregate supply curve is steeper for increases in output than for decreases (The "L-shaped" AS function beloved of many old Keynesian texts.). Hence decreases in the money supply move us along a horizontal AS if we get the sticky price equilibrium, while increases in M move us along an upward sloping, though not vertical, AS curve, since prices adjust but only partially.

END NOTE

1.   One of the desirable features of Ball and Romer is that they have started from utility maximization to obtain the demand curves for their consumers. One might wonder if demand functions such as what we have could be the outcome of utility maximization. It turns out that in an n good world, n-1 demands can have the form $Q_1 = (M - b_iP_i)/P_n$ and arise from utility maximization. While these demand functions are not exactly the ones we have above, they suggest that the results we get are consistent with standard assumptions. Details of this computation can be obtained from the authors upon request.

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APPENDIX

Case 1: M decreases to 2/3 of its old value

Suppose λ proportion of firms reduce *money* price by 1/3. First we show that this will give them the optimal relative price. We start from $\frac{M_o}{P_o} = 2$. We now have $M_1 = 2M_o/3$.

$$P_1 = \frac{\left(\lambda\left(\frac{2}{3}\right) + (1-\lambda)(1)\right)P_o}{} = \left(1-\frac{\lambda}{3}\right)P_o$$

Thus $\frac{M_1}{P_1} = \left(\frac{2/3}{\lambda\left(\frac{2}{3}\right)+(1-\lambda)}\right)\frac{M_o}{P_o} = \left(\frac{2/3}{\left(1-\left(\frac{\lambda}{3}\right)\right)}\right)\frac{M_o}{P_o} = \left(\frac{2}{(3-\lambda)}\right)\frac{M_o}{P_o}$

So $\frac{1}{2}\frac{M_o}{P_1} = \left(\frac{1}{2}\right)\left(\frac{2}{(3-\lambda)}\right)2 = \left(\frac{2}{3-\lambda}\right) = $ optimal $\frac{P_i}{P}$.

Since the adjusters have $P_i = \frac{2}{3}P_o$ and $P_1 = \left(1-\frac{\lambda}{3}\right)P_o$, the adjusters have relative price:

$\frac{P_i}{P_1} = \frac{2/3 P_o}{\left(1-\frac{\lambda}{3}\right)P_o} = \left(\frac{2}{3-\lambda}\right)$, which is optimal as shown above.

Now we want to find the payoff to adjusting and the payoff to not adjusting both as functions of λ, the proportion who adjust. Here is the picture.
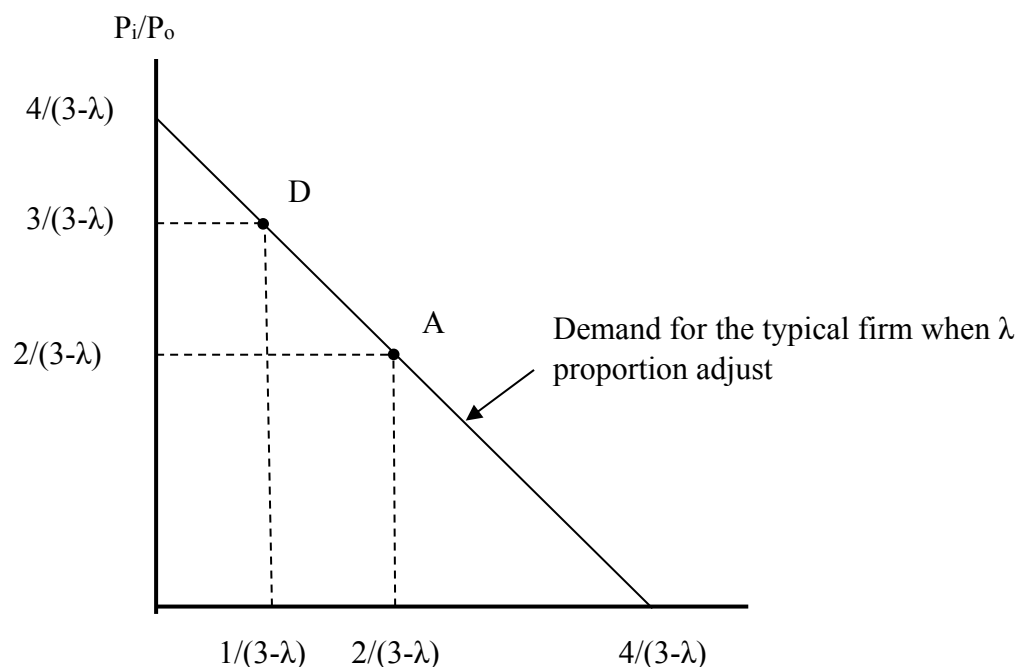
As noted above, when λ proportion adjust, the new real money supply = $\left(\frac{2}{(3-\lambda)}\right)\frac{M_0}{P_0}$ = $\left(\frac{2}{(3-\lambda)}\right)2$ = $\left(\frac{4}{(3-\lambda)}\right)$.
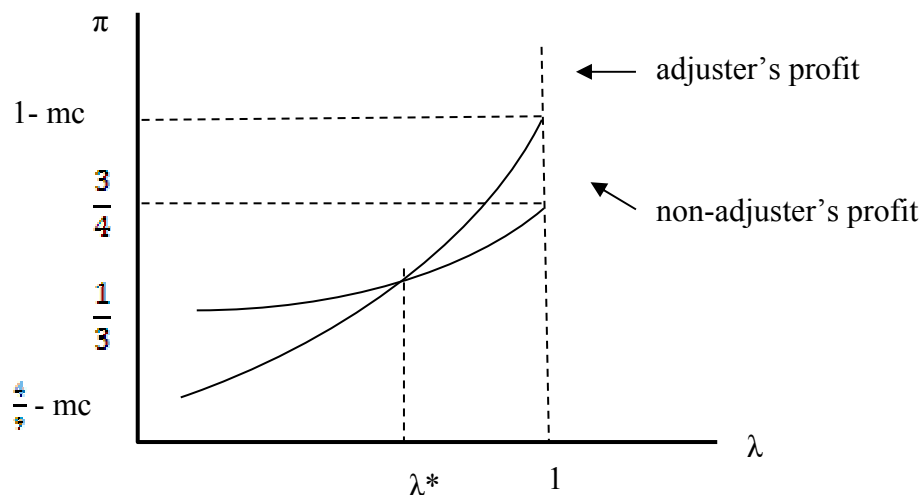
The adjusters set relative prices at $\left(\frac{2}{(3-\lambda)}\right)$ and sell $\left(\frac{2}{(3-\lambda)}\right)$ units, earning $\left(\frac{4}{(3-\lambda)^2}\right)$ - mc where mc is the menu cost.

The non-adjusters will have relative price = $\frac{P_0}{P_1} = \left(\frac{P_0}{(1-\frac{\lambda}{3})P_0}\right) = \left(\frac{1}{(1-\frac{\lambda}{3})}\right) = \frac{3}{3-\lambda}$. They sell $\frac{1}{3-\lambda}$ units and pay no menu costs, earning $\left(\frac{3}{(3-\lambda)^2}\right)$. We have two payoff functions, one for adjusters, π = $\left(\frac{4}{(3-\lambda)^2}\right)$ - MC, and one for non-adjusters, π = $\left(\frac{3}{(3-\lambda)^2}\right)$

Graphing both payoff functions gives us the following.

The payoff functions intersect at λ* = $3 - \left(\frac{1}{mc}\right)^{\frac{1}{2}}$ under the assumption that $\frac{1}{9} < mc < \frac{1}{4}$. If mc < 1/9, then the adjuster's profit function lies everywhere above the non-adjuster's, so the only equilibrium has all adjusting. If mc exceeds ¼, on the other hand, then the situation is reversed – the non-adjuster's profit is then everywhere above the adjuster's, so λ = 0 is the only equilibrium – none will adjust. With our assumptions, both λ = 0 and λ = 1 are equilibria, since at λ = 0, not adjusting give greater profit than adjusting, while at λ = 1, adjusting give the greater profit.

There is also a mixed strategy equilibrium here which has each firm adjusting with probability λ*. This is because when other firms will adjust with probability λ*, the proportion adjusting (among a large number of firms) will be λ*, so that adjusting with probability λ* is a (weak) best response given the firm's indifference between adjusting and not at λ*. But λ* is clearly unstable. If λ > λ*, even slightly, the payoff to adjusting exceeds the

payoff to non-adjusting, so all will adjust. If $\lambda < \lambda^*$, even slightly, the payoff to not adjusting exceeds the payoff to adjusting so none will adjust. The two stable equilibria are $\lambda = 0$ and $\lambda = 1$.

Case 2: M increases to 3/2 its former value

Here we have $M_1 = (3/2)M_o$. Again let λ proportion increase money price to 3/2 its initial value. The new price level, P_1 is

$$P_1 = \lambda (3/2)P_o + (1-\lambda)P_o = \left(1 + \frac{\lambda}{2}\right) P_o .$$

So $\dfrac{M_o}{P_1} = \dfrac{\frac{3}{2}M_o}{\left(1+\frac{\lambda}{2}\right)P_o} = \left(\frac{3}{2+\lambda}\right)\dfrac{M_o}{P_o} = \left(\frac{3}{2+\lambda}\right)2 = \left(\frac{6}{2+\lambda}\right)$.

The optimal relative price is, then, $\dfrac{1}{2}\dfrac{M}{P}$, as usual, or $\left(\dfrac{3}{2+\lambda}\right)$. Note that those who have increased *money* prices as supposed have *relative* prices of $\dfrac{\frac{3}{2}P_o}{\left(1+\frac{\lambda}{2}\right)P_o} = \left(\dfrac{3}{2+\lambda}\right)$ and so have indeed adjusted optimally.

A non-adjuster will have a relative price equal to $\dfrac{P_o}{\left(1+\frac{\lambda}{2}\right)P_o} = \left(\dfrac{2}{2+\lambda}\right)$. Here is the demand curve for the typical firm:
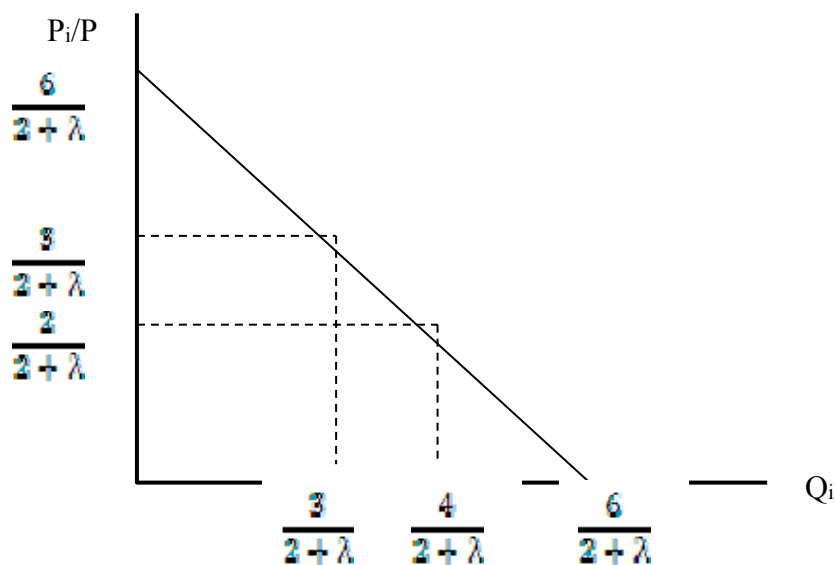
Thus the payoff to adjusting is: $\left(\dfrac{3}{2+\lambda}\right)\left(\dfrac{3}{2+\lambda}\right) - mc = \dfrac{9}{(2+\lambda)^2} - mc$.

The payoff to not adjusting is: $\left(\frac{2}{2+\lambda}\right)\left(\frac{4}{2+\lambda}\right) = \frac{8}{(2+\lambda)^2}$. Again, assuming $1/9 < mc < \frac{1}{4}$, the payoff functions can be drawn as shown below.
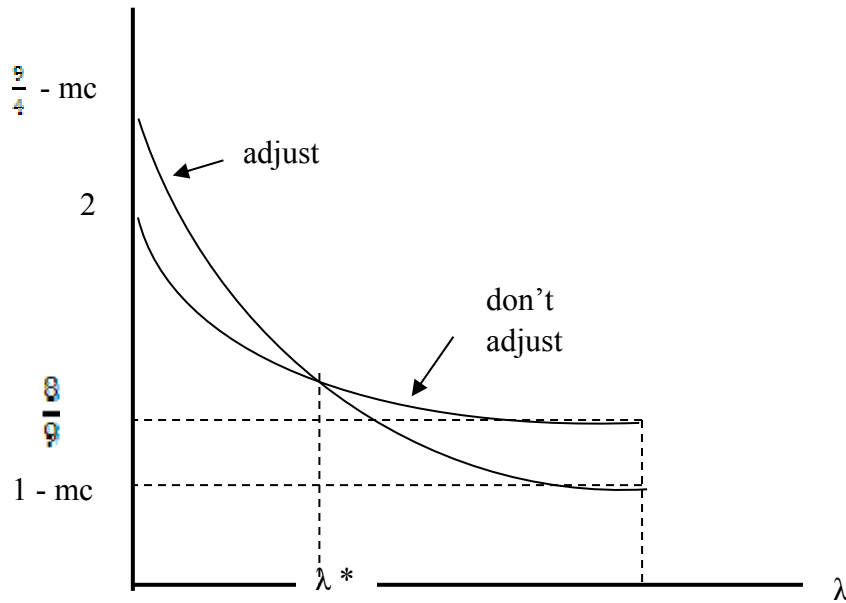
λ^* solves: $\frac{9}{(2+\lambda)^2} - mc = \frac{8}{(2+\lambda)^2}$. So $\lambda^* = \left(\frac{1}{mc}\right)^{1/2} - 2$.

Here neither 0 nor 1 are equilibria since at 0, the payoff to adjusting exceeds the payoff to not adjusting, while at 1, the reverse is true. We now have a stable equilibrium at λ^*, since for $\lambda > \lambda^*$, non- adjustment has a higher payoff, so λ falls; while for $\lambda < \lambda^*$, adjustment has a higher payoff, so λ increases. It is easy to see that the discussion in the main text of the paper follows this appendix for the special cases of $\lambda = 0$ and $\lambda = 1$.

A LONG HARD SLOG: DEBT AND ECONOMIC RECOVERY

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ABSTRACT

This article reviews both the historical record and economic theory in exploring the impact of debt on economic recovery. It is hoped that this paper can provide a context to better understand our current economic difficulties.   It begins by describing the forces that drove the rapid expansion of household debt in the 1920s and its role in contributing to the depth and duration of the Great Depression. Then it reviews the economic literature on the relationship between debt and macroeconomic performance. From there, the article considers the effects of the debt build up during the 2000s and the resulting financial crisis on our current levels of economic activity. Lastly, our paper investigates several policy responses that the United States can pursue in addressing our economic challenges.

INTRODUCTION

Over the last several years, the United States economy has faced the deepest reduction in real GDP and the slowest recovery since the Great Depression.   Though the economy has experienced twenty five consecutive months of net job growth, economic growth has been sluggish and unemployment remains stubbornly high.   Why was the drop off in economic activity so steep? What accounts for the slow pace of recovery?

In their ambitious book *This Time is Different*, economists Kenneth Rogoff and Carmen Reinhart have empirically investigated a wide variety of financial crises endured by sixty-six countries over the last eight centuries (Reinhart and Rogoff, 2009). Their research indicates that economic downturns that follow financial crises are more severe and persist much longer than typical recessions. It "typically takes an economy more than four years just to reach the same *per-capita* income level that it had attained at the pre-crisis peak" (Rogoff, 2011).   They argue that our current economic miseries are largely the result of the recent housing crisis and the large fiscal imbalances that have built up over the last decade. While many economists have portrayed the economic crisis as "The Great Recession," Rogoff and Reinhart have called it the "Second Great Contraction" (with the Great Depression being the First Great Contraction). The authors contend that this "contraction applies not only to output and employment, as in a normal recession, but to debt and credit, and the deleveraging that typically takes many years to complete" (Rogoff, 2011). Deleveraging refers to the process of paying down of private and

public debt by households, businesses, and taxpayers. The housing crisis which precipitated our current economic woes was preceded by dramatic increases in both private and public debt. The painful process of deleveraging that has followed this crisis has both inhibited and delayed a return to robust economic expansion. This report explores the impact of debt on economic activity and the implications for our current situation.

We begin by taking a historical perspective, looking back at the period that preceded the "First Great Contraction," a time of rapidly expanding household debt. Next, our report reviews several theoretical explanations that describe how debt contributes to the depth and duration of economic slumps. Then, we analyze the effects of the debt build up during the 2000s on the recent recession and on current economic recovery. Lastly, our paper discusses economic strategies that United States can take in addressing the enduring consequences of the financial crisis.

A TALE OF TWO CONTRACTIONS

The Armistice that brought World War I to a close in 1918 triggered a rapid demobilization from the war effort in the United States. The abrupt cancellation of military contracts, the cessation of war production, and the return of hundreds of thousands of soldiers to the labor force precipitated a brief downturn in the economy during the first half of the following year. Despite this hiccup, the economy roared back by the second half of the year. The robust economic rebound combined with the maintenance of low discount rates by the Federal Reserve, however, fueled inflationary pressures. In response, the Federal Reserve in late 1919 initiated a series of discount rate increases such that, by June 1920, rates had climbed from 4.75% to 7.0%, a 47% increase (Walton and Rockoff, 2010, 390-1)!

These rate increases set off a sharp but relatively short economic downturn, a classic V-shaped recession. From 1920-21, nominal net national product declined by 18% leading to a jump of 7.9% in the unemployment rate. The same period witnessed a dramatic deflation in the overall price level with the wholesale price index falling by 37%. The simultaneous reduction in both nominal output and the overall price level accounted for a relatively modest 4% decline in the real net national product (Walton and Rockoff, 2010, 391; Hughes, 1990, 448). The tremendous amount of wage and price flexibility in the economy meant that actual purchasing power by consumers was not greatly affected. If wages and overall prices fall at similar rates, the amount of goods and services that consumers can afford will be approximately the same. It is this flexibility that largely accounted for the quick recovery. By 1922, the stage was set for a period of sustained and robust economic growth known as the "Roaring Twenties."

By contrast, the Great Depression was both severe and protracted. While many associate the Great Depression with the 1929 Stock Market crash, the economy really didn't hit bottom until several years later. Below, business historian John Steele Gordon described the state of the economy in 1932:

Gross national product that year was $58 billion, a mere 56 percent of what it had been three years earlier. Unemployment stood at an entirely unprecedented 23.6 percent. But that did not tell the whole story, for millions more were working part-time or at much reduced wages. The number of hours of labor worked in 1932 was fully 40 percent below the level of 1929. Another 1,453 banks had failed, bringing the depression total to a staggering 5,096. In 1929 Americans had held about $11 in bank deposits for every dollar in currency and coin in circulation. By 1932 the ratio was five to one, because so many banks had failed and so many more were distrusted. The Dow-Jones Industrial Average fell as low as 41.22, down 90 percent from its high of three years earlier and less than a point above where it had stood the first day it had been calculated in 1896 (Gordon, 2004, 328).

In addition to its severity, the length of the Great Depression distinguished it from all other slumps experienced by the United States. The "real GNP did not return to its pre-Depression level until 1937 and real GNP did not catch up to its pre-Depression secular trend until 1942. Indeed, the unemployment rate, peaking at 25 percent in March 1933, continued to dwell near or above the double-digit range until 1940. It is in this sense that most economists attribute the ending of the Depression to the onset of World War II" (Parker, 2010).

Why did the Great Depression last so long? What unique impediments slowed the pace of economic recovery? Economic historians continue to try to tackle these questions to this day. Some of the causes that economists still debate include the tight monetary posture of the Federal Reserve; state laws prohibiting branch banking which left many banks unable to diversify their holdings; the absence of sufficient fiscal stimulus by states and the federal government (until WWII); the Smoot-Hawley Tariff which initiated devastating trade wars leading to a large drop in US exports; and the unintended consequences of numerous New Deal policies. While there certainly is no single explanation for the duration of the Great Depression, the dramatic structural changes that occurred in the American economy between the two downturns that bookend the 1920s has largely been overlooked by most economists.

The "Roaring Twenties" truly marked the beginning of today's modern consumer economy. Financial innovations like installment credit fueled rapid growth in the demand for consumer durables like homes, automobiles, appliances, radios, and furniture (Parker, 2010). Before 1920, consumers typically relied on their savings to buy these items. Though some households borrowed to finance the purchase of their homes, down payments usually exceeded fifty percent of a home's value and home mortgages had to be repaid within five years. In the 1920s, banks extended the terms of home mortgages to twenty years while down payments declined to 33% of a home's sale price (Lebergott, 1984, 436-438). Throughout this time period, households increasingly were relying on credit in supporting home purchases. "In 1912 some 47 percent of expenditure for new homes was financed by credit. By 1920-22 the figure had risen to 55 percent. By 1925-29, to 66 percent" (Lebergott, 1984, 437-438). These changes increased rates of homeownership and contributed to the housing boom of the 1920s. In the early 1920s,

the "number of housing starts rose each year (including the depression of 1920-21) until it peaked in 1925 at 937,000 units…" (Atack and Passell, 1994, 580).

The availability of credit for other consumer durables had a significant impact on households' spending patterns. As economic historian Jonathan Hughes explains, instead "of saving in interest-earning assets to finance ultimate purchases, a down payment and an initial installment contract transferred ownership of the assets – with a lien – and consumers used the assets while their payments reduced consumption expenditures from other commodities" (Hughes, 1990, 446). The change in spending patterns by households accounted for expenditure increases of 8.3% per annum on consumer durables during the 1920s. Consumers largely relied on installment credit in financing well over 70 percent of expenditures made on autos, furniture, pianos, phonographs, radios and household appliances that were sold during this period (Hughes, 1990, 446). "Outstanding nonmortgage consumer debt more than doubled in the 1920s, reaching a 1929 peak of $7.6 million – 9.3 percent of income – that was not surpassed until 1939" (Olney, 1999, 43). The wide availability of credit also played a central role in fuelling the stock market bubble of the late twenties. The practice of "margin trading" became widespread as investors financed the purchase of stock, only having to provide a relatively small percentage of the value of equity to the bank as a down payment. From 1928 to 1929, household liabilities had increased by 12%, largely driven by this kind of speculation (Mishkin, 1978).

DEBT AND CONTRACTION: ECONOMIC THEORY

Economic crises are often events that stimulate new developments in economic theory. Keynesian economic analysis emerged out of the depths of the Great Depression while the stagflation of the 1970s sparked the rise of the monetarist and new classical schools in macroeconomics. Keynesian economics focuses on the role of governmental fiscal policy in stabilizing the economy. The monetarist school emphasizes the role of money supply on macroeconomic performance. The new classical school has been extremely skeptical of active fiscal policy, arguing that the rational responses to any policy measure would undermine the effectiveness of such policy.

The tendency for one school to dominate economic theory after an economic crisis often obscures important contributions from economists who offer alternative perspectives. One interesting example is the work of economist Irving Fisher. During the first two decades of the twentieth century, Fisher played a prominent role in developing a modern economic theory of interest and in updating the "quantity theory of money" (Nasar, 2011). Despite these major contributions, Fisher's influence on economics and the public at large had waned by the 1930s. One reason for this decline was Fisher's unfortunate declaration that "stock prices had reached a permanently high plateau" just before the Great Crash in October 1929 (The Economist, 2009).

In 1933, Irving Fisher published "The Debt-Deflation Theory of Great Depressions" in *Econometrica*, a highly respected economic journal. In that paper, Fisher describes how high levels of debt combined with deflation can cause the economy to descend into a downward spiral, leading to an economic depression. According to Fisher, such episodes are typically preceded by periods of rising indebtedness fueled by easy money and speculative borrowing. "When an investor thinks he can make over 100 percent per annum by borrowing at 6 percent, he will be tempted to borrow, and to invest or speculate with borrowed money. This was a prime cause leading to the over-indebtedness of 1929" (Fisher, 1933, 348). It is the inevitable bursting of the speculative bubble that sets off the debt-deflationary spiral.

And just as a bad cold leads to pneumonia, so over-indebtedness leads to deflation. And, vice versa, deflation caused by the debt reacts on the debt. Each dollar of debt still unpaid becomes a bigger dollar, and if the over-indebtedness with which we started was great enough, the liquidation of debts cannot keep up with the fall of prices which it causes. In that case, the liquidation defeats itself. While it diminishes the number of dollars owed, it may not do so as fast as it increases the value of each dollar owed. Thus, the very effort of individuals to lessen their burden of debts increases it, because of the mass effect of the stampede to liquidate the swelling of each dollar owed. Then we have the great paradox which, I submit, is the chief secret of most, if not all, great depressions: The more the debtors pay, the more they owe. The more the economic boat tips, the more it tends to tip. It is not tending to right itself, but is capsizing (Fisher, 1933, 344).

In simpler language, deflation in the form of falling asset prices and wages has the effect of increasing the debt burdens of households and businesses (which do not fall in value). While household incomes and asset prices decline during deflationary periods, loan payments on homes, consumer durables, and equity do not fall. In order to reduce their debt burdens, households and businesses attempt to sell their assets to pay off their loans. The rush to sell assets by many households and businesses contributes to declining asset prices thereby increasing indebtedness and leading to another round of falling prices. The feedback effects between debt and deflation can plunge the economy into a deep depression by decreasing consumers' purchasing power thereby reducing their demand for goods and services.

Building on Fisher's debt-deflation theory, Frederic Mishkin (1978) in "The Household Balance Sheet and the Great Depression" introduced the "liquidity hypothesis theory" to describe the negative effect of indebtedness and deflation on aggregate demand during the Great Depression. In his paper, Mishkin points out that the level of household indebtedness from borrowing to purchase consumer durables and common stock during the 1920s dramatically increased in real, inflation adjusted terms as prices fell from 1929 to 1933. "When indebtedness is high, the consumer has large contractual debt service payments that increase the likelihood of financial distress" (Mishkin, 1978, 925). The resulting financial distress "leads to consumers to prefer holding highly liquid financial assets rather than illiquid tangible assets which are costly to sell in an emergency" (Mishkin, 1978, 925). This preference for liquid assets that do not lose

value reduced the aggregate demand for more illiquid, durable assets. In 1930 alone, household spending on consumer durables fell by over twenty percent while expenditures on residential housing declined by 40 percent (Mishkin, 1978, 931). This reduction in aggregate demand, according to Mishkin, greatly contributed to the severity of the downturn (Mishkin, 1978).

Long before he became the Chairman of the Federal Reserve, Ben Bernanke focused much of his early research efforts as an academic economist in analyzing the Great Depression. Ben Bernanke has contended that to "understand the Great Depression is the Holy Grail of macroeconomics" (Bernanke, 2004). Like Fisher and Mishkin, Bernanke (1983) emphasized the effects of debt deflationary spiral on U.S. macroeconomic performance in the 1930s. Critics of the debt-deflation explanation pointed out that the net effect of rising real debt should be close to zero because the losses suffered by debtors represent gains to creditors (The Economist, 2009). Bernanke, however, concentrated on the adverse consequences of debt-deflation on the allocation of credit which he argued led to significant reductions in the level of consumption and investment. In his analysis, he describes "a central function of banks is to screen and monitor borrowers, thereby overcoming information and incentive problems. By developing expertise in gathering relevant information, as well as by maintaining ongoing relationships with customers, banks and similar intermediaries develop 'informational capital.'" (Bernanke, 2007). The banking failures that dominated the early 1930s decreased the amount of informational capital available in the economy needed to support the provision of credit. The reduction in the availability of credit, according to Bernanke, was responsible for the much of decline in business investment and expenditures on consumer durables.

The early 1930s also was a period of rapidly rising indebtedness as the "ratio of debt service to national income went from 9% in 1929 to 19.5% in 1932-33" (Bernanke, 1983, 261). This increase largely was the result of falling output and incomes which reduced the disposable incomes of households. "Nominal GDP fell by 46% between 1929 and 1933" (The Economist, 2009). These factors in combination with asset price deflation increased the real debt burden borne by borrowers. The reduction in the net worth of borrowers in the form of lower asset prices increased the cost of financial intermediation by inhibiting the use of collateral as insurance against default. Bernanke explains:

In general, the availability of collateral facilitates credit extension. The ability of a financially healthy borrower to post collateral reduces the lender's risks and aligns the borrower's incentives with those of the lender. However, in the 1930s, declining output and falling prices led to widespread financial distress among borrowers, lessening their capacity to pledge collateral or to otherwise retain significant equity interests in their proposed investments. Borrowers' cash flows and liquidity were also impaired, which likewise increased the risks to lenders. Overall, the decline in the financial health of potential borrowers during the Depression decade further impeded the efficient allocation of credit (Bernanke, 2007).

Banks recognized that raising interest rates to compensate for added risk was self-defeating because doing so increases the probability of default (Bernanke, 1983, 265-266). The

higher verification cost involved in extending credit represents a true financial friction "because it has to be charged to the borrower but is not a benefit to the lender" (Hall, 2010, 7). By making it difficult for banks to determine the creditworthiness of borrowers, these frictions fundamentally reduced the amount of credit available for businesses to invest in new ventures and for households to finance purchases of homes and other consumer durables, thus negatively impacting demand. According to economist Robert Hall, Bernanke's contribution to economic theory has had an enormous impact on current economic thinking. "The dominant view among macroeconomists today is that a financial crisis causes real economic activity to collapse by raising financial frictions" (Hall, 2010, 7).

In addition to increases in private indebtedness, financial crises are often associated with rapidly rising public debt. The marked increase in public debt after a financial crisis is often a result of increasing governmental expenditures on financial bailouts, automatic stabilizer programs and stimulus packages combined with declining government revenues that results from a fall in overall economic activity. If public debt is high before the financial crisis, the rising debt that follows may have negative effects on economic growth and thus delay recovery. Empirical studies of advanced countries show a negative correlation between public debt as percentage of GDP and rates of economic growth. "Over the past two centuries, debt in excess of 90 percent has typically been associated with mean growth of 1.7 percent versus 3.7 percent when debt is low (under 30 percent of GDP), and compared with growth rates of over 3 percent for the middle categories (debt between 30 and 90 percent of GDP)" (Rogoff and Reinhart, 2010, 3). A recent 30 year study of 18 OECD countries confirms these results, showing that governmental debt exceeding 85% of GDP has negative effects on economic growth (Cecchetti, Mohanty, and Zampolli, 2011).

Reinhart and Rogoff contend that rising levels of public debt at some point induce "debt intolerance" on the part of investors. Investors look at government debt to GDP ratios to assess the ability of nations to make future payments. Governments with high ratios may be forced to raise interest rates to induce wary investors to buy debt. "Sharply rising interest rates, in turn, force painful fiscal adjustment in the form of tax hikes and spending cuts, or, in some cases outright default" (Rogoff and Reinhart, 2010, 2). The combined effects of tax hikes and spending cuts to address the debt have negative effects on aggregate demand and economic growth. In addition, high public debt significantly hampers the ability of government to respond to financial crises. "When a crisis strikes, the ability of the government to intervene depends upon the amount of debt that it has already accumulated as well as what its creditors perceive to be its fiscal capacity – that is, the capacity to raise tax revenues to service and repay the debt. Fiscal authorities may become constrained both in their attempt to engage in countercyclical stabilization policies and in their role as lender of last resort during a financial crisis" (Cecchetti, Mohanty, and Zampolli, 2011, 4). The diminished capability of governments facing heavy debt burdens contributes to the delay in economic recovery.

DEBT AND THE SECOND GREAT CONTRACTION

As discussed in the introduction, our current economic difficulties are not the result of a normal cyclical downturn that economies experience on a periodic basis but stem from the recent financial crisis that continues to have long lasting negative effects on macroeconomic performance.

Figure 1 shows *Real Gross Domestic Product as a Percent of Previous Peak* for years 1959 to the present with the shaded areas representing periods of recession. This figure clearly demonstrates that the economic slump that began in early 2008 was not your garden variety recession. The decline in real GDP relative to previous peak was far greater and persisted far longer than any other downturn over this time period.
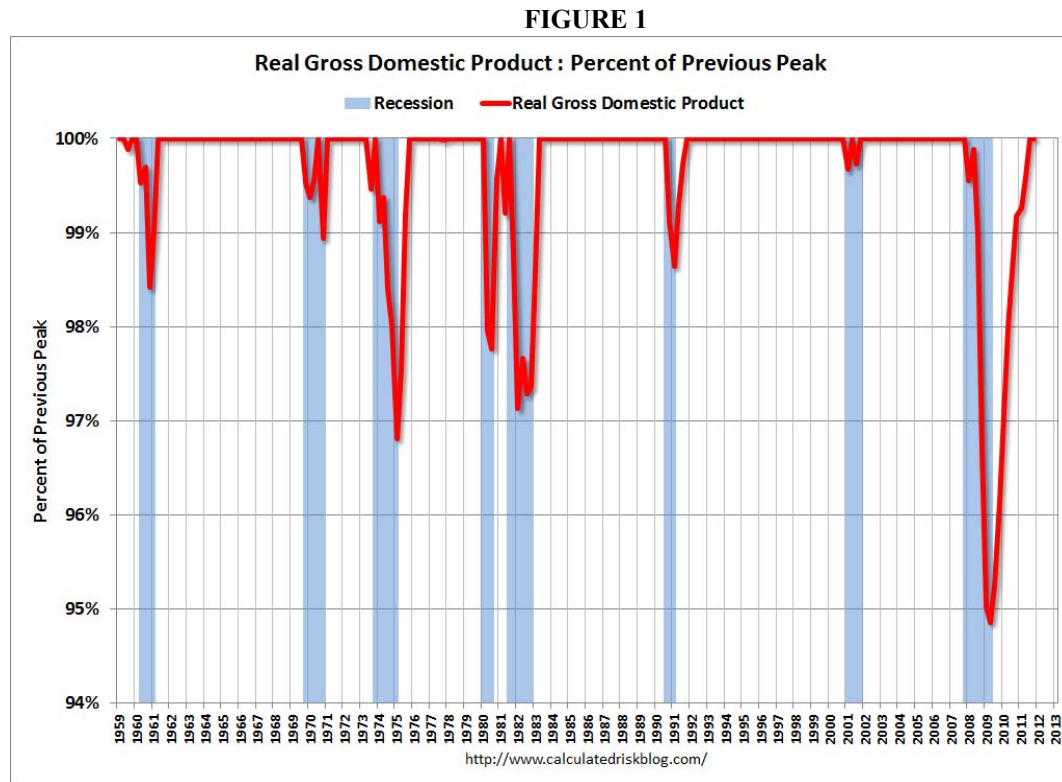
FIGURE 1

The fact that real GDP has rebounded and is now at the previous peak by no means implies that economy overall is doing well. As figure 2 shows, there is a significant gap between actual real GDP and potential real GDP, indicating that the economy still has a long way to go before if fully recovers from the effects of the financial crisis.

FIGURE 2
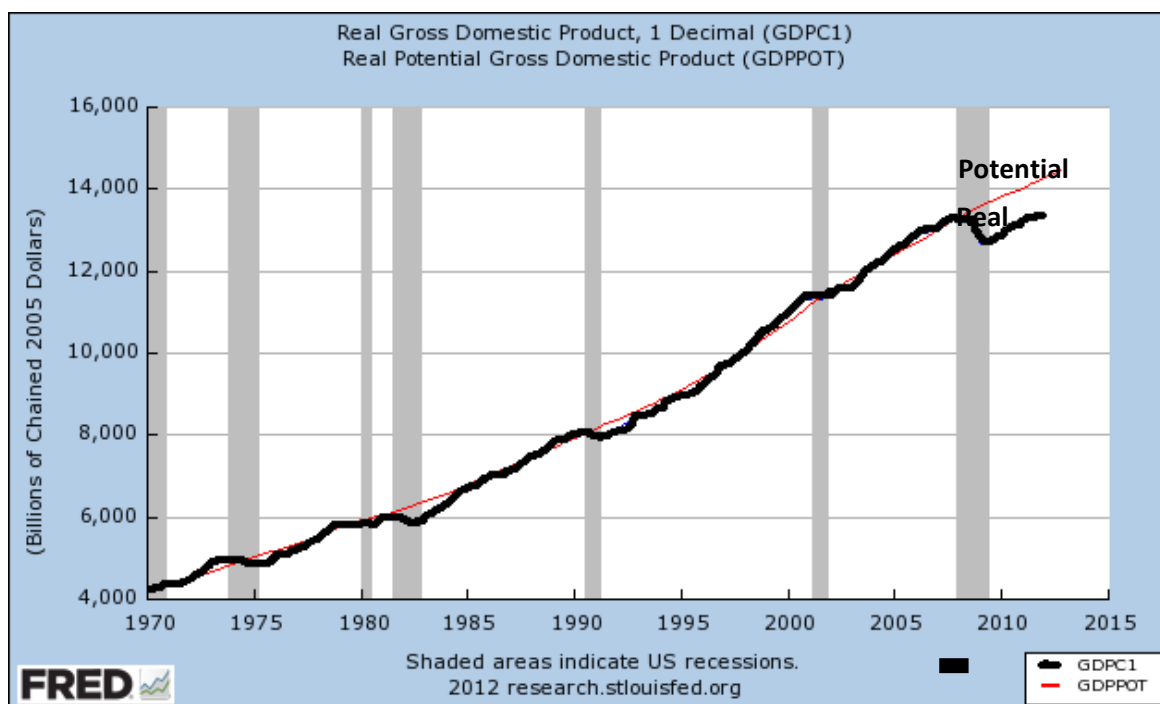
Evidence of a lack of a full recovery in employment is also provided in Figure 3 which presents *Employment as a Percent of Previous Peak*. It shows that total employment had fallen over 6% by the end of the recession in 2009. While there have been gains since this period, the numbers are still well off those of the previous peak, strongly suggesting that the productivity increases of workers who avoided job losses made up for the lost output of those who had been laid off.

The first decade of the 21st century witnessed dramatic increases in private debt. Much of the increase in private debt can be attributed to the housing boom. Housing prices skyrocketed as the housing bubble continued to inflate during the boom years from 2000 to 2006.   Figure 4 presents the *CoreLogic House Price Index*. Using January 2000 as the base year (2000 = 100), the index shows that prices effectively doubled over this six year period. Higher prices in the housing market fuelled increases in private debt as households secured larger mortgages to finance their purchases.

FIGURE 3

Employment: Percent of Previous Peak
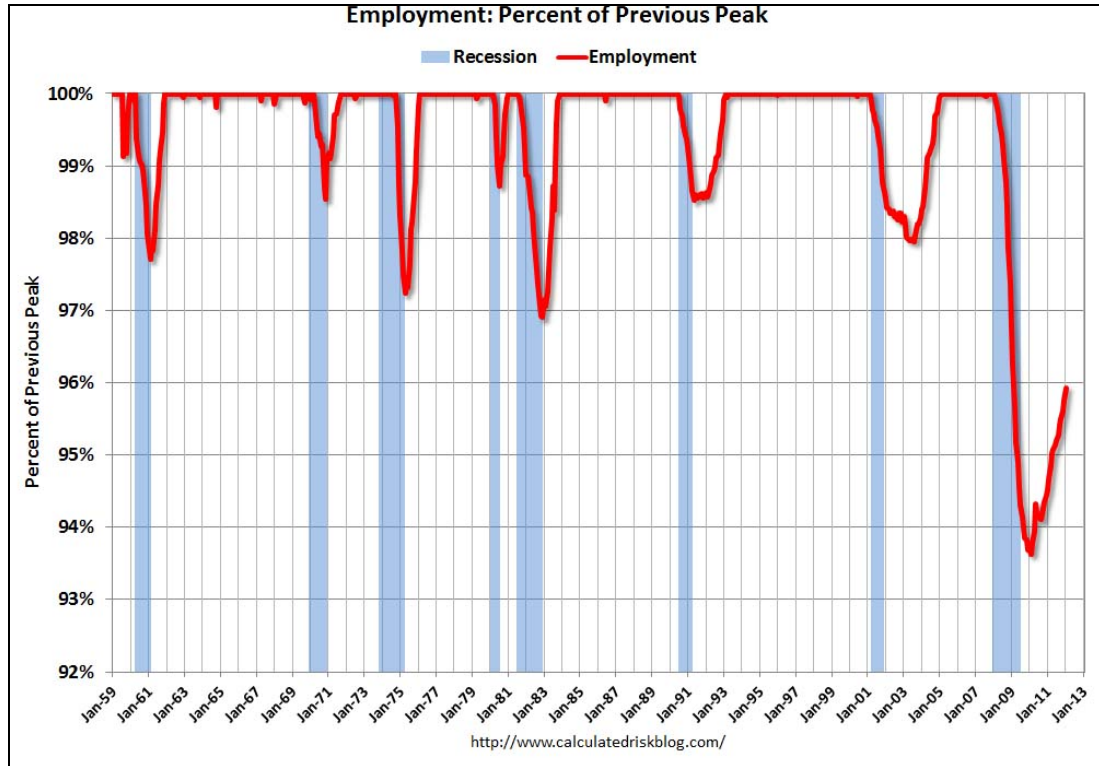
FIGURE 4

CoreLogic House Price Index
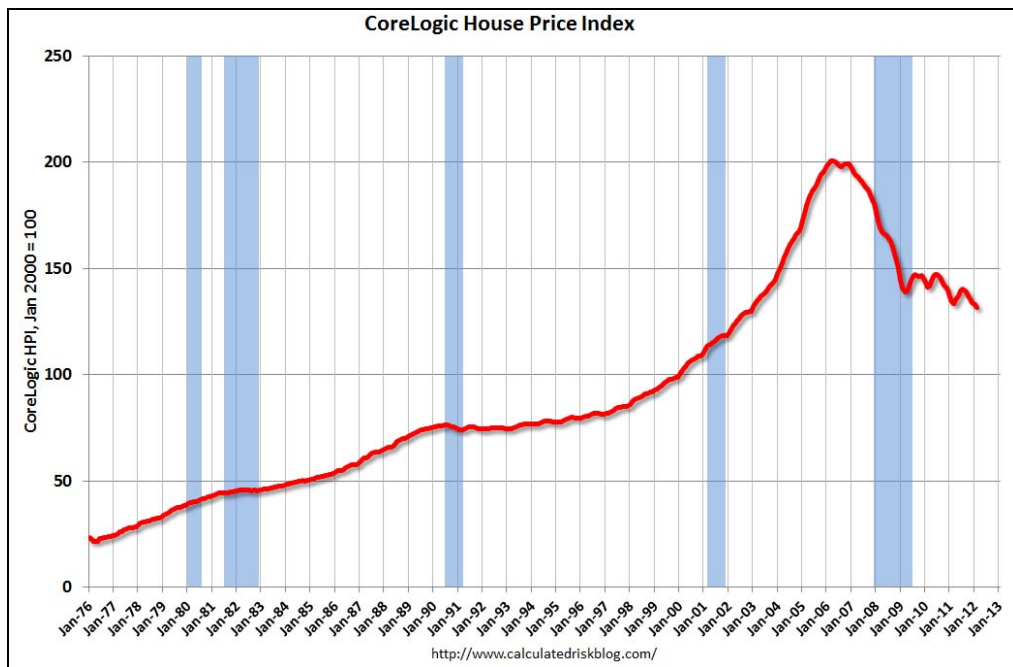
Figure 5 shows the *Total Debt Balance and its Composition* from 1999 to 2011 on a quarterly basis. From first quarter 1999 to the third quarter 2008, total household debt nearly tripled with the bulk of the increase come from rising mortgage debt.

FIGURE 5
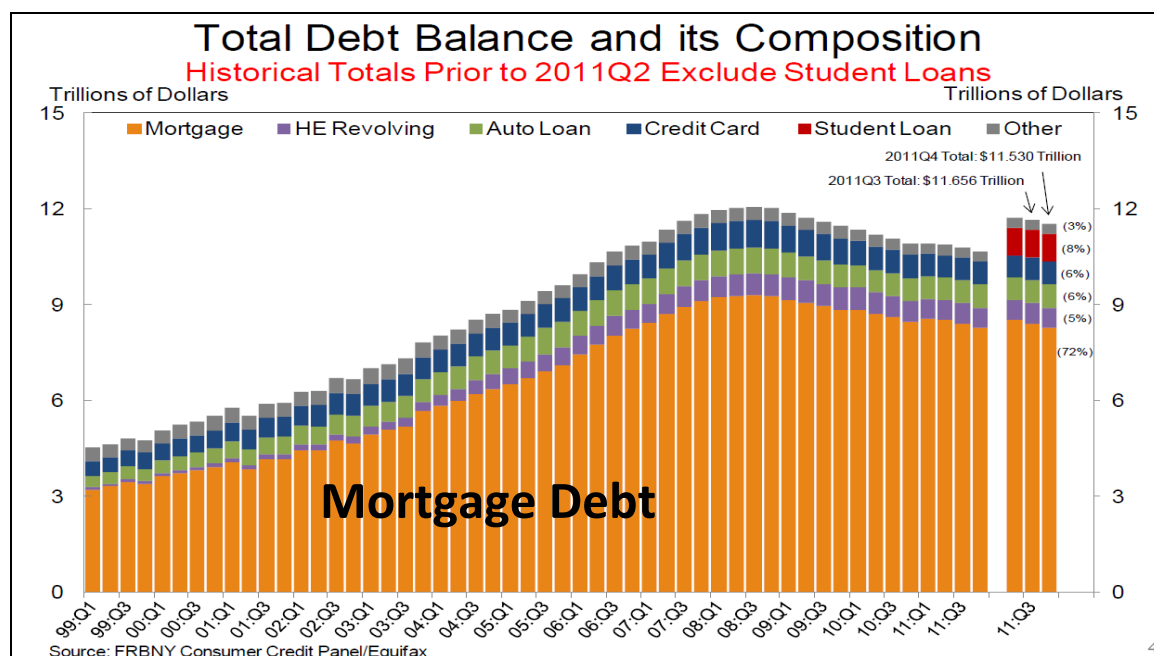
Figure 6 presents the *Household Debt Service Payments as a Percent of Disposable Personal Income*. This figure also indicates a considerable increase in private leveraging during this time period as debt service payments rise from about 12 percent of disposable income in 2000 to 14 percent by the fall of 2007 (Norris, 2012). Economists Reuven Glick and Kevin Lansing have found that much of the economic expansion during the 2000s was financed through increases in private debt. "During the boom years of the mid-2000s the combination of declining savings rates and rapidly rising household debt allowed consumer spending to grow much faster than disposable income, providing a significant boost to the economy" (Glick and Lansing, 2011, 1). Since the beginning of the crisis, debt service payments have fallen dramatically as households have focused their efforts on reducing their debt burdens. Currently, debt service payments are approximately 10.8 percent of disposable income, the lowest level since 1994 (Norris, 2012).

FIGURE 6

Household Debt Service Payments as a Percent of Disposable Personal Income (TDSP)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions.
2012 research.stlouisfed.org
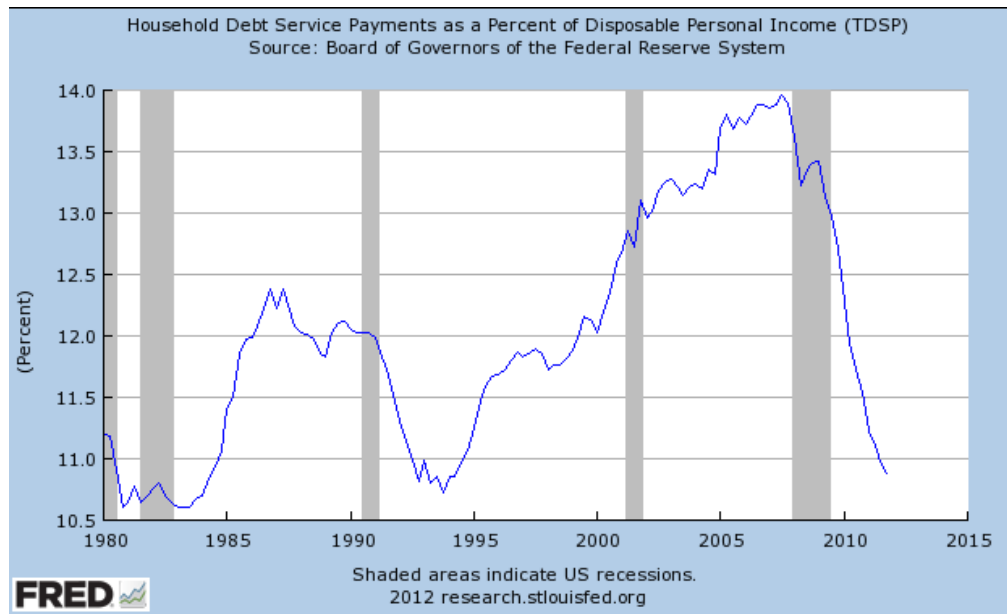
U.S. government debt has also risen dramatically since the beginning of the economic crisis. Figure 7 presents the *Government Debt as a Percent of GDP*. Government debt represents the amount of money the federal government owes its creditors including government bonds. The debt to GDP ratio currently stands at 93.2 percent which is over the 90 percent threshold that Reinhart and Rogoff (2010) have found to correlate with falling rates of economic growth.

FIGURE 7

UNITED STATES GOVERNMENT DEBT TO GDP
Percentage of the GDP

SOURCE: WWW.TRADINGECONOMICS.COM | U.S. BUREAU OF PUBLIC DEBT
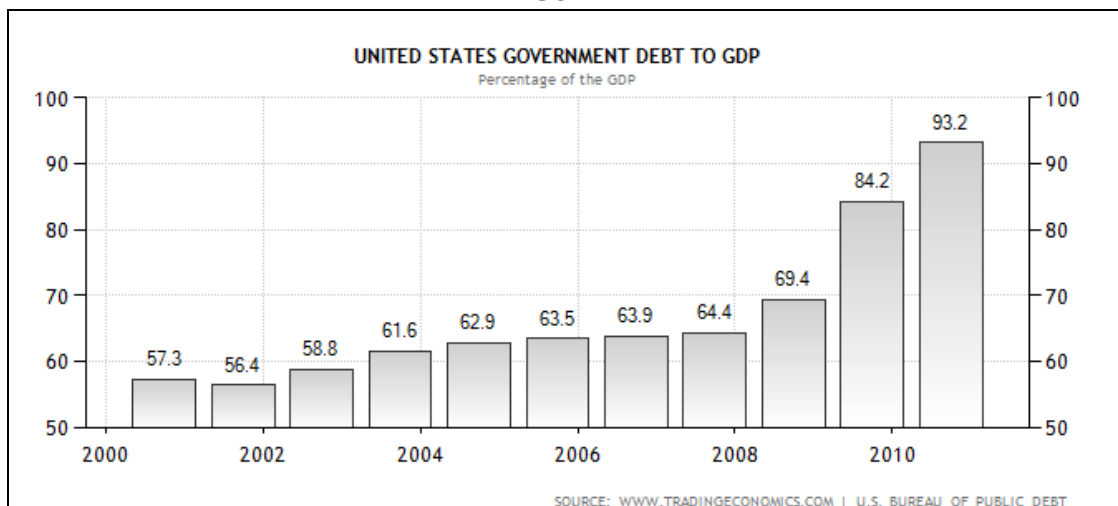
Figure 8 provides greater context for the rising debt by showing both *Federal Net Outlays and Federal Receipts*. Federal net outlays represent disbursements by government for purchases, transfer payments, and interest on the debt minus payments that governmental agencies make to other governmental agencies (Hall and Lieberman, 2013). Increases in the federal debt are often associated with economic downturns as federal expenditures rise (from fiscal stimulus, financial bailouts, and automatic stabilizers) while revenues fall as economic activity declines. Here, we can see that the financial crisis led to increasing levels of federal expenditure and falling revenues.

FIGURE 8
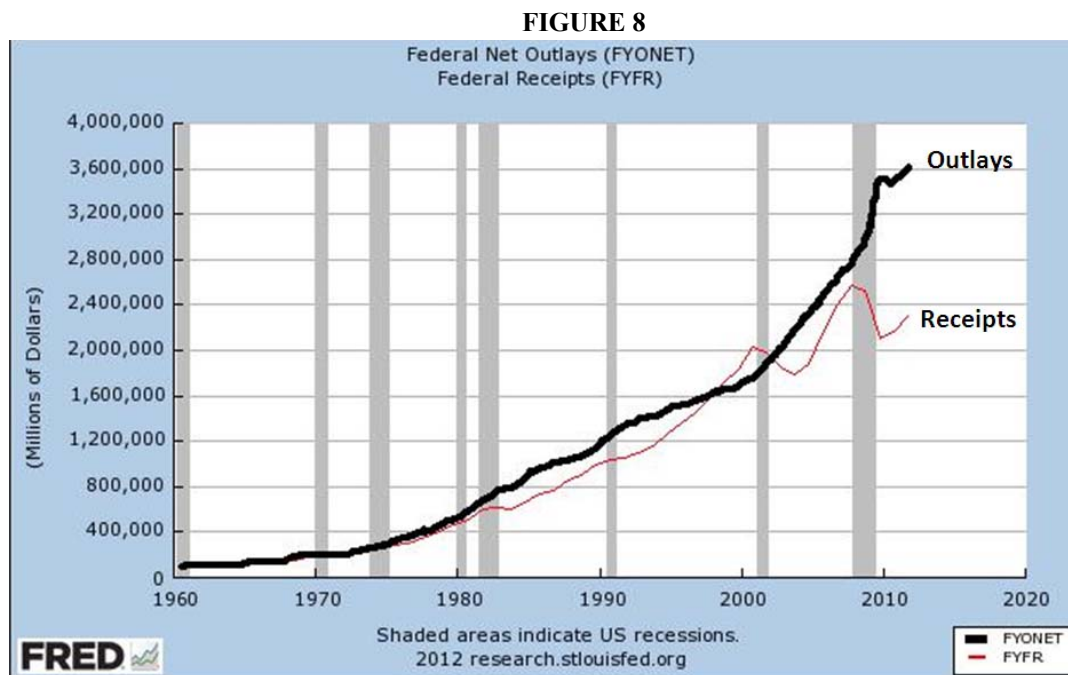
In our review of the economic theory on debt and depression, Fisher, Mishkin and Bernanke, despite their different emphases, found that high levels of private debt exacerbated downturns by effectively reducing household expenditures on consumer durables and by reducing business investment. Recent economic evidence about changes in economic activity following the financial crisis seems to bear out these hypotheses. Figure 9 presents *Changes from the Fourth Quarter of 2007 in Four Components of Real GDP during the Crisis*. These four components include net exports, government purchases, consumption of nondurables and services, and investment, broadly conceived. The investment component "includes investment-type purchases by consumers, business investment in plant, equipment, and inventories, and residential investment. The crisis did not cause a general contraction in spending. Rather, the contraction is essentially entirely in investment" (Hall, 2010, 4).

FIGURE 4

Changes from the Fourth Quarter of 2007 in Four Components of Real GDP during the Crisis
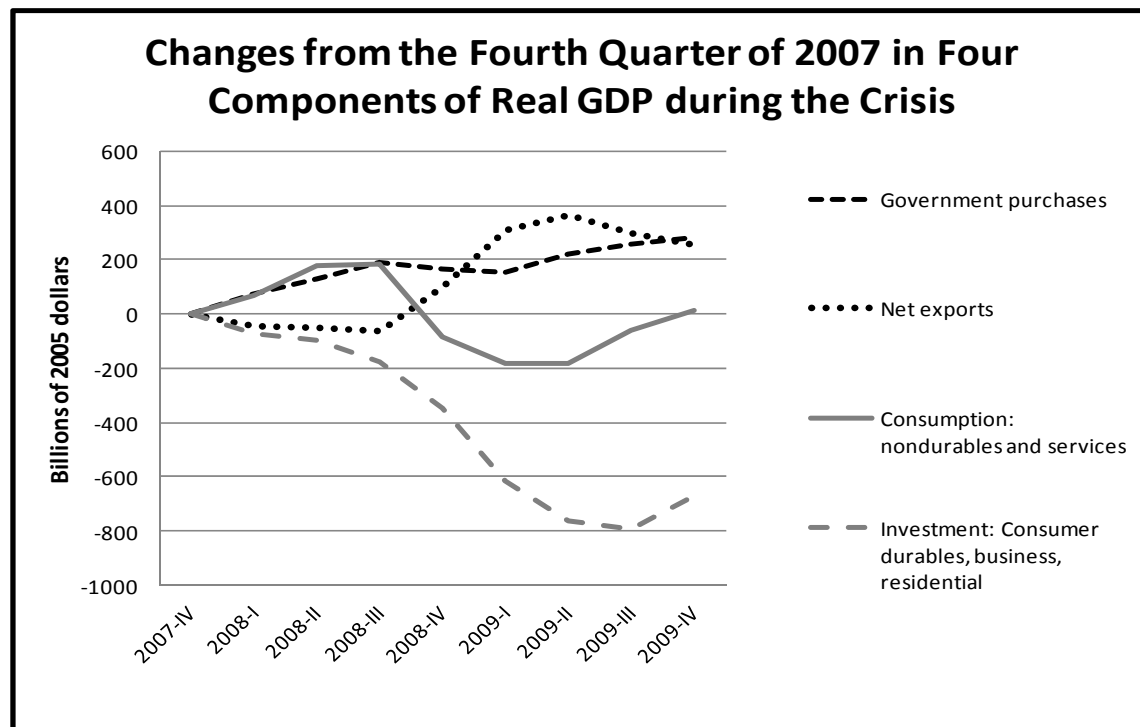
The economic fallout of the financial crisis has not been uniformly borne by all regions of the country. Those areas for which household debt burdens were the highest (mainly as the result of the housing bubble), experienced the greatest declines in economic activity. Using county-level data on household debt and automobile sales, economists Atif Mian and Amir Sufi (2011) have found a strong negative relationship between household debt levels and expenditures on consumer durables during both the recession and recovery time periods. Automobile sales, for example, fell sharply for both high household debt counties and low household debt counties during the recession. While low debt household counties experienced a strong rebound in sales after the recession, auto sales continued to languish in high debt counties during the recovery. The authors argue that overleveraged households have been responsible for sustained, weak demand for consumer durables. This weak demand, according to the authors, also helps explain the large cash balances held by corporations who are reticent to invest if the household sector is encumbered with high levels of debt (Mian and Sufi, 2011).

WHICH WAY FORWARD?

What policy measures should the United States take to help reduce its debt burdens and facilitate the economic recovery process?   Unlike the United States, a number of European nations like the United Kingdom, Spain, and Italy have increased taxes and aggressively reduced government spending to address their large fiscal imbalances.   Should the United States implement similar austerity measures in tackling its public debt problem?   How would such a strategy affect economic growth and the deleveraging of private debt?

In their report, *Debt and Deleveraging: Uneven Progress on the Path to Growth*, the McKinsey Global Institute examines the progress of the "world's ten largest mature economies" in reducing their levels of public and private debt.   The report also looks "at the relevant lessons from history about how governments can support economic recovery amid deleveraging" (McKinsey Global Institute, 2012, 1).   Their analysis finds that the United States has the opportunity to follow a deleveraging process that consists of two distinct phases.   "In the first, households, corporations, and financial institutions reduce debt significantly over several years while economic growth is negative or minimal and government debt rises.   In the second phase, growth rebounds and government debt is reduced gradually over many years" (McKinsey Global Institute, 2012, 1).   The success of this strategy crucially depends upon the willingness of the United States to credibly commit to implementing structural reforms that bolster economic growth and that address its fiscal imbalances in the medium and long term.

The McKinsey group bases much of its conclusions on the historical experience of Finland and Sweden in the 1980s and 1990s.   Both nations during this time period experienced housing bubbles and busts that left their economies reeling and mired in debt.   Each country pursued a deleveraging process that comprised of the two phases described above.   The first phase involved several years of significant deleveraging in the private sector as households, corporations, and financial institutions worked on repairing their balance sheets.   During this time, the "ratio of private sector debt to GDP declined by about one-fourth….   This was also a time of negligible economic growth, in which tax revenues fell and public expenditures grew to support the economy.   As a result, government debt rose sharply, growing from 46 percent of GDP to 83 percent in Sweden from 1990 to 1994, and from 14 percent to 57 percent of GDP in Finland over the same time period" (McKinsey Global Institute, 2012, 15).

For Sweden, the decline in the level of private debt during these years and the adoption of structural reforms by the Swedish government were important prerequisites for addressing the public debt problem.   By 1994, the reduction of debt burdens on businesses and households set the stage for a period of economic growth and public sector deleveraging.   The excerpt below explains:

In Sweden, the Social Democratic Party came to power on a platform that promised to bring government finances under control.   Sweden reduced its annual deficit from 7 percent of GDP in 1993 to zero in 1998, and then gradually began to reduce the level of outstanding public

sector debt relative to GDP. Sweden's ratio of government debt to GDP fell from 84 percent at its peak in 1996 to 45 percent by 2008. Reviving nominal GDP growth was essential to this process: the absolute amount of government debt actually remained the same over this period. Of the 39 percentage-point drop in the ratio of government debt to GDP, about 28 points were the result of real GDP growth. Inflation – which some observers suggest may be an easier way to reduce government debt than cutting expenditures – contributed almost 11 percentage points" (McKinsey Global Institute, 2012, 16).

The McKinsey Global Institute contends that the United States is in a position to follow a similar two phase strategy. Their analysis shows that United States' total debt to GDP ratio is significantly lower than many other mature economies and that the US is also further along in the private debt deleveraging (phase 1) process.

Figure 10 below shows the composition and total debt of these mature economies as a percentage of GDP at the end of the second quarter in 2011. It breaks total debt into the following categories: household, nonfinancial corporations, financial institutions, and government debt. There is significant variation in the composition of total debt across these countries. As a percentage of GDP, the United States has significantly lower total debt levels (as a percent of GDP) than European countries like U.K, Spain, France, and Italy. The exception here is Germany which has total debt levels that are almost identical to the United States.

**Figure 10: Total Debt of Ten Largest Mature Economies, Q2 2011 % of GDP**
Nation	*Households*	*Nonfinancial Corporations*	*Financial Institutions*	*Government*	*Total*
Japan	67	99	120	226	512
U.K.	98	109	219	81	507
Spain	82	134	76	71	363
France	48	111	97	90	346
Italy	45	82	76	111	314
S. Korea	81	107	93	33	314
U.S.A.	*87*	*72*	*40*	*80*	*279*
Germany	60	49	87	83	278
Australia	105	59	91	21	277
Canada	91	53	63	69	276
McKinsey Global Institute

Though the decline so far has been modest, the United States has made greater progress in reducing its total debt burdens as a percentage of GDP relative to the other nations. Figure 11 shows the *Change in Total Debt of the Ten Largest Mature Economies* as a percentage of GDP in the pre-crisis time period (2000 to 2008) and the period since the financial crisis (2008 – Q2 2011). During the pre-crisis period, total debt as a percentage of GDP increased 75.2 percentage points for the United States. From 2008 to the second quarter of 2011, total debt as a percentage of GDP decreased 16.1 percentage points. Since government debt as a percentage of GDP had

increased during this period, the net reduction in total debt as a percentage of GDP is the result of private deleveraging. Two-thirds of the decline in U.S. household debt since 2008 was the result of defaults on home mortgages and other consumer debt (McKinsey Global Institute, 2012, 3). Using 2000 as a target year for household debt to GDP ratios, McKinsey estimates that households "are a bit more than one-third of the way through deleveraging" (McKinsey, 2012, 20). McKinsey estimates that, for the United States, phase 1 deleveraging could be completed by 2014, setting the stage for a rebound in economic growth and public sector deleveraging. Until then, economic growth is likely to be weak.

Figure 11: Change in Total Debt of Ten Largest Mature Economies, % of GDP (Percentage Points)		
Nation	*2000 - 2008*	*2008 – Q2 2011*
Japan	36.5	38.9
United Kingdom	177.2	20.3
Spain	145.2	25.6
France	88.8	35.4
Italy	67.8	11.5
South Korea	91.4	-15.5
United States	*75.2*	*-16.1*
Germany	7.2	1.2
Australia	77.0	-14.0
Canada	39.0	17.0
McKinsey Global Institute/The Economist (01/21/12)		

European nations (except Germany) have seen significant increases in total debt as a percentage of GDP during both periods. "The transatlantic differences stem from the trajectory of private debt. Government borrowing soared everywhere after 2008 as government deficits ballooned. But in America the swelling of the public balance sheet has mirrored a shrinking of private ones. Every category of private debt – financial, corporate, and household – has fallen as a share of GDP since 2008…. In Europe private debt has fallen by less and in some cases has grown" (The Economist, 2012).

In addition to a cyclical return to economic growth, the McKinsey report lists six markers that need to be evaluated in order to assess the progress nations have made as they head into the second phase of deleveraging. They include:

Marker 1: Is the banking system stable?
Marker 2: Is there a credible plan for long-term fiscal sustainability?
Marker 3: Are structural reforms in place to unleash private-sector growth?
Marker 4: Are there conditions set for strong export growth?
Marker 5: Is private investment rising?
Marker 6: Has the housing market stabilized?

Markers 2, 3 and 6, in particular, represent major challenges for the United States. Though private debt has fallen, government "debt has risen rapidly in the United States since the crisis due to the sharp decline in tax revenue and increases in automatic spending for such items as unemployment benefits. Because the United States entered the financial crisis with growing deficits, government debt – including that of federal, state, and local government – has reached the highest level as a percent of GDP since World War II" (McKinsey Global Institute, 2012, 21). The government debt levels for the United States will be significantly higher than those faced by Sweden and Finland when they began to enter phase two of the process. Given these higher levels, it is critical that the United States implement a credible medium and long-term plan to address its fiscal imbalances.

In addition, the US needs to put into effect structural reforms that will increase economic productivity. "The United States should encourage business expansion by speeding up regulatory approvals for business investment, particularly by foreign companies, and by simplifying the corporate tax code and lowering marginal tax rates in a revenue-neutral way. Business leaders also say that the United States can improve infrastructure and the skills of its workforce and do more to encourage innovation" (McKinsey Global Institute, 2012, 34). Much of the lack of progress in these two areas stems from the political gridlock that dominates Washington D.C.

Though the rate of price decreases has fallen, the housing market has not fully stabilized. "New housing starts in the United States remain at roughly one-third of their long-term average levels and in 2011 home prices continued to decline in many parts of the country. Without price stabilization and an uptick in new housing starts, a stronger recovery of GDP growth will be difficult. In the United States, residential real estate construction alone equaled 4 to 5 percent of GDP before the bubble and can do so again, once the market is cleared of excess inventory and there is demand for new construction" (McKinsey Global Institute, 2012, 39).

CONCLUSION

This report has argued that the "Second Great Contraction" did not represent a typical cyclical downturn but was the result of the inevitable bursting of the housing bubble after a boom period that saw rapid increases in both housing prices and household debt. Downturns that follow financial crises are much more severe and persist for longer periods of time. A skeptic of this line of reasoning might argue that the recession in 2000-01 was largely the result of the bursting of the stock market bubble of the 1990s. Despite this, the economy rebounded reasonably quickly and robustly from that recession. The major difference between the two episodes is the amount of leverage that was used in purchasing assets during the boom period. Economist Robert Hall explains that in 2000-01 recession, "the assets in decline in that episode were business assets, mainly in a sector, high tech, that uses little debt finance and thus has little

leverage….. Business equity resides in large portfolios of rich families, in mutual funds, and in endowments, and these entities rarely borrow against their holdings" (Hall, 2010, 18).

That certainly is not the case with real estate which relies heavily on leverage. Again, Hall elaborates: "Most homeowners borrow as much as they can when buying a house; they become unlevered only if they remain in the house and pay down the mortgage. In the 2000s, borrowing as much as you could meant borrowing close to the entire price of the house. The story of the multiple added levels of leverage among financial institutions holding real-estate-related assets has now been told many times. Thus the economy is severely at risk from even a small decline in real estate values…" (Hall, 2012, 18).

While times ahead will not be easy, the United States has an opportunity to address its debt problems without being forced to implement the types of short-run, austerity measures that we see in Europe. Such an opportunity, however, requires the necessary political will to address difficult medium and long-run imbalances that threaten economic growth and the standard of living in the decades ahead. Our current political system, however, seems unwilling or incapable of tackling such issues.

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LEAD-LAG ASSOCIATION OF MORTGAGE RATE WITH HOUSING PRICE

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ABSTRACT

The current economic and financial crisis is an upshot of housing market episode that begun with subprime mortgage lending practice. The current housing market episode appears to be significant and may be the most severe one in history. The unsustainable incrementally sequential association of subprime mortgage rate, stepping into homeownership rate, and then spreading into housing price over time is the root cause of the plunge of housing market. Spillover effect of this housing crisis spread into other financial/economic markets and is likely to be prolonged due to their domino effect properties. Thus, this economic event has important implications for market participants and financial regulators for understanding the cross-correlation dynamics of housing market behavior. This study, thus explores the role of time delayed mortgage rate effect on the housing price with regard to the understanding of market dynamics. In general, housing price may depend on various internal and external factors and mortgage rate being one of them. Therefore, the purpose of this paper is to understand the cross-correlation dynamics of market behavior with particular emphasis placed upon the role of mortgage rate. Specifically, the present study attempts to identify and isolate the particular lead-lag association between mortgage rate and housing price in conjunction with economic cycle. Housing market plays a significant role as a leading indicator of the economy and therefore understanding the market dynamics cannot be overemphasized. The interesting observation of this research would be the findings of length of time delayed effect of mortgage rate on the housing price in the domain of complex housing market environment.

INTRODUCTION AND BACKGROUND

In this research we explore the association of internal factors and other information externalities in the determination of residential housing price to observe the cross-correlation dynamics of housing market. In recent years, the housing markets have experienced some episodes of large proportions as a result of persistent increase and then followed by significant decrease in housing demand and their prices. The current housing episode appears significantly worse and perhaps the most severe in the recent history of housing market. The current housing market episode arise with the subprime mortgage lending surge, which in turn increased the homeownership rates significantly and caused sharp appreciation in housing prices. This sequential association then reversed itself due to the economic capacity that is finite and limited.

Consequently, the subprime mortgage crisis weakened the housing market and eventually the economy as a whole. Since the peak of housing market (in 2006), the Home Price Index has declined considerably and created a domino effect of widespread mortgage defaults. In addition, the spillover effect of this housing crisis spread into other financial/economic markets and is likely to be prolonged due to their domino effect characteristics. Thus, this has important implications for market participants and regulators interested in identifying risk factors by understanding the cross-correlation dynamics of housing market.

Therefore, the objective of this research is to observe the nature of the cross-correlation dynamics of mortgage rate and its relationship with housing price over time. To this endeavor, we estimate the model of home values using several internal and external factors. These factors may contain physical characteristics of a home as well as economic characteristics of that time period. Thus, isolating the time delayed effect of mortgage rate on the housing price after controlling for relevant factors, primarily internal factors. In this study, we have considered only single family housing. Therefore, zoning differentials is not a major factor. Zoning differentiates land use as per its classifications. Different zoning classifications have different conditions and characteristics (see, Phoebe, Koenig, and Pynoos 2006; Shoked, 2011). Other aspects of zoneing and its effects on the price of house has been studied by researchers (Cho, Kim, and Lambert, 2009; Mukhija, Regus, Slovin, and Das, 2010). These suggest that zoning significantly affects housing prices (Glaeser and Gyourko, 2002).

Housing market plays a significant role as leading indicator of the economy, and therefore understanding the market dynamics cannot be overemphasized, especially in light of the recent housing market turmoil and its effect on the economy. Since, the movements in the housing market will likely continue to play an important role in the business and economy (Bernanke and Gertler, 1995), understanding the market mechanism, specifically the lead-lag relationship between factors can offer mortgage lenders and insurance providers among other participants a notion about the association of these factors, and thus, provides a better understanding for designing appropriate policies and products (Stanton and Wallace, 1998). This insight of such association may then be applied to the formation of new regulations and guidelines.

As a result of such importance of the housing market on the economy, researchers have devoted much of their effort to identify factors that determine the housing market mechanism (Sander & Testa 2009; Lyytikäinen, 2009; Fratantoni & Schuh, 2003; Taylor, 2007; Bradley, Gabriel, & Wohar, 1995; Vargas-Silva, 2008). Many factors have been cited (Ewing & Wang, 2005; Kearl, 1979) as sources of housing market dynamics; among these, housing price (Rapach & Strauss, 2009) and housing starts (Lyytikäinen, 2009; Ewing & Wang, 2005; Puri & Lierop, 1988; Huang, 1973) play a very important role. These studies have been primarily designed to examine particular aspects of these markets, such as the relationship between residential construction and credit accessibility (Rajan, 1994; Taylor, 2007).

Overall, empirical evidence suggest a contemporaneous positive association between number of houses sold and number of houses for sale, which is an inventory issue. However, time-series investigations invariably have delayed time dependent effect. Therefore, the purpose of this paper is to understand the cross-correlation dynamics of housing market with particular emphasis placed upon the role of housing price. Specifically, using the research design discussed in the following section, the present study attempts to isolate particular lead-lag association between mortgage rate and housing price in conjunction with economic cycle as specified in this paper.

Regression model of the housing price that takes serial correlation into consideration will be examined and estimated using multiple predictor variables. The interesting observation of this research would be the findings of length of time delayed effect of mortgage rate on the housing price. In addition, this study will also explore the impact of economic cycle (as defined in this paper) on the housing price after adjusted for inflation. Thus, the housing price and its value are considered to be time dependent.

Table-1A: Summary Statistics of single-family housing factors.					
Variables	**N**	**Mean**	**Std Dev**	**Minimum**	**Maximum**
Price_Real	2329	175296.94	66962.98	13535.38	531264.38
MotgRate	2329	7.49	1.11	4.3500000	10.48
Condition	2329	0.90	0.085	0.34	0.99
Bedrooms	2329	3.30	0.65	1.00	8.00
Bathrooms	2329	2.48	0.90	1.00	9.00
Totbldgft	2329	1694.20	615.37	529.00	4860.00
Gsqft	2329	530.49	192.80	159.00	2136.00
Lotsqft	2329	11841.57	4052.50	1350.00	43740.00
Age	2329	35.82	19.32	1.00	153.00

DATA AND METHODOLOGY

The data includes sales price among other information, spanning from January, 1990 to October, 2010. The data types that we have used for our analysis are only single-family residential properties. Any observation that has missing data was eliminated from the analysis. Also, data that deemed outlier are eliminated to have a consistent less skewed distribution for a reliable estimation. For the estimation of the model, the sample includes only those residential properties with a single-family detached building.

Internal factors

Internal factors that are considered**:** Age of the house, Number of bedrooms, Number of bathrooms, Condition of the house (0.00 to 0.99), Lot square footage, Total building square footage, Garage square footage, and some of the second order terms of these factors.

External factors

External factors that are considered: Economic Cycle (as defined in this study), Monthly seasonality, and 30-year-mortgage rate.

| Table-1B: Summary Statistics of Sales Price by Month. |
Month	Median	Mean	Std	Min	Max	N
JAN	162811.71	179329.72	63411.61	43561.48	364960.27	123
FEB	156186.21	170210.36	59725.94	40096.22	370021.35	114
MAR	162166.80	175853.40	68178.79	36731.23	412471.06	156
APR	155681.12	169265.71	72893.76	34431.71	531264.38	156
MAY	157379.62	177216.79	62361.24	32611.77	431195.97	251
JUN	164058.01	172876.05	56527.72	35782.67	343620.66	268
JUL	153509.65	172391.80	68716.33	13535.38	495176.91	275
AUG	166344.29	176759.36	64176.93	29482.51	384344.49	254
SEP	159791.96	178298.89	68853.89	32475.21	459744.68	202
OCT	157828.83	176015.79	74252.64	32259.07	508080.32	212
NOV	158197.72	175603.89	75894.79	31473.54	510763.08	184
DEC	161153.32	180647.81	69785.67	49301.21	477498.55	134
Total	159721.23	175296.94	66962.98	13535.38	531264.38	2329

Variables and Analysis

To estimate the value of the house, we associate variety of internal factors, such as, age of the house, number of bedrooms, number of bathrooms, total building square footage, total lot square footage, condition of the building. Location characteristics, such as, recreational facilities, roads, shopping centers, etc. may be relevant in estimating the housing value. The influence of public good provision and the presence of amenities on the value of a house cannot be denied. They may generate appealing differences between properties and thus create differences in price value. But, they may impact the value of the house positively and/or negatively and thus will offset in its effect. Thus, these factors are not considered in this study. Conversely, mortgage rates that increases or decreases the purchasing power has influence on the selling price of a house and are correlated with the economy. Therefore, mortgage-rate is considered as an external factor in our study to observe any mortgage-rate dependent effect on the housing value.

Specifically, we study any lagged effect on the expected selling price. The data were ordered by year and by month to understand and identify the effect of external factors over time, such as, mortgage rate and economic cycle. It is expected that house prices increase during economic accession and decline during economic recession. However, nominal price of a house may increase steadily over time. Therefore, the selling price of houses was adjusted for inflation and the real price of houses was used in our analysis. Thus, data on these factors that are stated above are collected and analyzed using associative models. Our research considers modeling

single-family housing and the dependent variable is the selling price of houses that are adjusted for inflation.

Table-1C: Summary Statistics of Sales Price by Year.					
Year	Median	Mean	Std	Min	Max	N
1990	151203.90	157782.53	62398.05	33398.28	310136.00	83
1991	141829.48	153446.14	71829.84	32259.07	508080.32	120
1992	152301.02	167181.96	69023.36	31473.54	449227.20	168
1993	161948.86	181387.05	79566.86	36478.06	420502.45	140
1994	170978.14	190516.29	80920.11	37689.93	510763.08	177
1995	158325.69	177581.61	70996.87	41793.84	411724.25	127
1996	148425.53	176216.28	65894.05	95104.34	531264.38	124
1997	162173.67	181804.34	60869.84	42551.88	351900.03	124
1998	166643.96	185939.23	69166.59	34431.71	403248.27	192
1999	162644.14	183338.20	69072.68	38853.11	436775.33	217
2000	161981.54	177788.87	61440.94	27998.92	349778.09	200
2001	159721.23	177022.58	53558.95	54939.96	354057.49	204
2002	158572.24	161504.00	51016.07	13535.38	390154.95	69
2003	157616.06	160145.19	64533.53	29482.51	477498.55	78
2004	163482.98	172712.84	54807.40	59780.70	356100.61	53
2005	164401.38	176251.10	69219.44	60974.71	462407.79	58
2006	169586.19	180918.60	66682.46	63710.29	495176.91	42
2007	152081.69	160498.93	43974.89	63330.31	369170.89	55
2008	150924.29	171468.10	79215.45	64961.13	431195.97	32
2009	153953.16	159638.33	34358.15	89696.52	316088.84	41
2010	159257.93	159312.58	55512.22	60820.56	312044.06	25
Total	159721.23	175296.94	66962.98	13535.38	531264.38	2329

To understand the relationship between selling price and other factors considered in this paper; we first perform correlation analysis (see Table-2) to examine the direction of the association between factors. Next, housing price (selling price of the property adjusted for inflation) is regressed on the predictors to observe the association. In addition to the primary internal factors (house characteristics), we have also explored time delayed external factor to observe the effect of certain factor's length of time on the housing (selling) price. As for example, a decrease in mortgage rate (more/less) may affect to increase the attention of purchaser and thus result in increase in housing prices two to three months later. Thus, several lag periods (one month lag, two month lag, and three month lag) were introduced during the estimation process of the regression model to identify the proper time delay. In general, it is assumed that there is a difference in prices between good economic period and difficult economic period in the process of estimating the value of the house and therefore, economic cycle (a dummy variable) is introduced into the model as an independent variable.

We have used SAS software (see, SAS/STAT User's Guide, 1993) to run the multiple regression models on several different factors of single-family housing characteristics. These

analyses that are based on external factors are to observe the differential effect over time on the value of houses due to change in economic environment. This measure is designed to test the hypothesis that housing value fluctuation is economy and time dependent. Specification of the regression model is of the following form:

$$\mathrm{Pr}ice\_\mathrm{Re}al = \beta_0 + \beta_1 MtgRate\_Lag2 + \beta_2 Econ\_Cycle + \beta_3 Condition + \beta_4 Bedrooms + \beta_5 Bathrooms +$$
$$\beta_6 Totbldgft + \beta_7 Gsft + \beta_8 LotSqft + \beta_9 Age + \beta_{10} Agesq + \beta_{11} Bedsq + \beta_{12} Bathsq +$$
$$\beta_{13} Feb + ... + \beta_{23} Dec + v$$

where:

Price_Real: Selling price of the property (building and land) adjusted for inflation.
Age: The age of any building (number of years) included in the property.
Totbldgft: The area in square feet of all buildings on the property.
LotSqft: The land area in square feet of the property.
Gsft: The area in square feet of the garage.
Bathrooms: *N*umber of bathrooms on the property.
Bedrooms: *N*umber of bedrooms on the property.
Condition: Condition of the building ranges from 0.00 (poor) to 0.99 (excellent)
MtgRate The 30-year-mortgage rate.
Econ_Cycle: Economic Cycle; a dummy variable: coded 1 for years 1995-2006 and 0 otherwise.
Feb-Dec: Dummy variables: coded 1 for the month and 0 otherwise.
Agesq, Bedsq, Bathsq: These are quadratic terms in the model.

In general, one can expect that an increase land area/ building area should increase the value of a property and thus increase the selling price; however, the magnitude of this effect diminishes slowly. Similar effect can be observed with the number of bathrooms or bedrooms. Similarly, the value of the property is expected to decrease when the age of the property increases. However, these relationships are not linear and therefore may be better captured by introducing a quadratic term in the model estimation. We can also hypothesize that an increase in mortgage rate should decrease the price of the property, since higher debt burden will be capitalized into a lower value of housing. To test these hypotheses in our study we have employed associative models in our analysis.

Table-2: Correlation Matrix of single-family housing factors.													
Sales Price	1.00 2329	0.331 <.000 2232	0.194 <.000 2329	0.307 <.000 2329	0.411 <.000 2329	0.264 <.000 2329	0.253 <.000 2329	-0.331 <.000 2329	-0.242 <.000 2329	0.192 <.000 2329	0.269 <.000 2329	-0.023 0.265 2329	0.051 0.012 2329
Condition	0.331 <.000 2232	1.000 2232	0.307 <.000 2232	0.487 <.000 2232	0.425 <.000 2232	0.266 <.000 2232	0.153 <.000 2232	-0.903 <.000 2232	-0.866 <.000 2232	0.303 <.000 2232	0.415 <.000 2232	0.040 0.057 2232	-0.008 0.674 2232
Bedrooms	0.194 <.000 2329	0.307 <.000 2232	1.000 2329	0.462 <.000 2329	0.525 <.000 2329	0.354 <.000 2329	0.114 <.000 2329	-0.308 <.000 2329	-0.245 <.000 2329	0.984 <.000 2329	0.389 <.000 2329	0.031 0.126 2329	-0.021 0.295 2329
Bathrooms	0.307 <.000 2329	0.487 <.000 2232	0.462 <.000 2329	1.000 2329	0.662 <.000 2329	0.405 <.000 2329	0.160 <.000 2329	-0.525 <.000 2329	-0.398 <.000 2329	0.453 <.000 2329	0.939 <.000 2329	0.009 0.635 2329	-0.012 0.543 2329
Totbldgft	0.411 <.000 2329	0.425 <.000 2232	0.525 <.000 2329	0.662 <.000 2329	1.000 2329	0.522 <.000 2329	0.259 <.000 2329	-0.452 <.000 2329	-0.284 <.000 2329	0.522 <.000 2329	0.610 <.000 2329	0.049 0.016 2329	-0.032 0.121 2329
Gsft	0.264 <.000 2329	0.266 <.000 2232	0.354 <.000 2329	0.405 <.000 2329	0.522 <.000 2329	1.000 2329	0.158 <.000 2329	-0.266 <.000 2329	-0.177 <.000 2329	0.358 <.000 2329	0.382 <.000 2329	0.012 0.546 2329	-0.000 0.986 2329
Lotsqft	0.253 <.000 2329	0.153 <.000 2232	0.114 <.000 2329	0.160 <.000 2329	0.259 <.000 2329	0.158 <.000 2329	1.000 2329	-0.143 <.000 2329	-0.087 <.000 2329	0.118 <.000 2329	0.143 <.000 2329	0.021 0.299 2329	0.002 0.916 2329
Age	-0.331 <.000 2329	-0.90 <.000 2232	-0.31 <.000 2329	-0.53 <.000 2329	-0.45 <.000 2329	-0.26 <.000 2329	-0.14 <.000 2329	1.000 2329	0.931 <.000 2329	-0.308 <.000 2329	-0.448 <.000 2329	-0.038 0.065 2329	0.003 0.862 2329
Agesq	-0.242 <.000 2329	-0.86 <.000 2232	-0.24 <.000 2329	-0.39 <.000 2329	-0.28 <.000 2329	-0.17 <.000 2329	-0.08 <.000 2329	0.931 <.000 2329	1.000 2329	-0.240 <.000 2329	-0.326 <.000 2329	-0.025 0.214 2329	0.004 0.820 2329
Bedsq	0.192 <.000 2329	0.303 <.000 2232	0.984 <.000 2329	0.453 <.000 2329	0.522 <.000 2329	0.358 <.000 2329	0.118 <.000 2329	-0.308 <.000 2329	-0.240 <.000 2329	1.000 2329	0.385 <.000 2329	0.034 0.091 2329	-0.024 0.240 2329
Bathsq	0.269 <.000 2329	0.415 <.000 2232	0.389 <.000 2329	0.939 <.000 2329	0.610 <.000 2329	0.382 <.000 2329	0.143 <.000 2329	-0.448 <.000 2329	-0.326 <.000 2329	0.385 <.000 2329	1.000 2329	0.000 0.980 2329	-0.006 0.771 2329
MtgRate_l2	-0.023 0.265 2329	0.040 0.057 2232	0.031 0.126 2329	0.009 0.635 2329	0.049 0.016 2329	0.012 0.546 2329	0.021 0.299 2329	-0.038 0.065 2329	-0.025 0.214 2329	0.034 0.091 2329	0.000 0.980 2329	1.000 2329	-0.323 <.000 2329
Econ_Cycle	0.051 0.012 2329	-0.01 0.674 2232	-0.02 0.295 2329	-0.01 0.543 2329	-0.03 0.121 2329	-0.00 0.986 2329	0.002 0.916 2329	0.003 0.862 2329	0.004 0.820 2329	-0.024 0.240 2329	-0.006 0.771 2329	-0.323 <.000 2329	1.000 2329

EMPIRICAL RESULTS

Larger standard deviation 66,962.98 of housing price with highest price being 531,264.38 and lowest of 13,535.38 (see Table-1A) does indicate much fluctuation in the property prices and thus, indicates a positively skewed distribution. Mortgage rate ranges from 4.35 to 10.48 (see Table-1A) during this time period reflect economic cycle that covers both up and downturn of the economy and may impact housing price. Similar differences also observed with other factors as well. In a similar context, there are also visible differences in frequency distribution of

number of houses sold in different months and thus exhibiting monthly seasonality in demand for houses. Highest frequency is observed in July and the lowest in February (see Table-1B). There also appears to be a declining trend in frequency (number) of houses sold over the years, specifically in recent years. Highest numbers of houses sold in 1999. This suggests that due to some unobservable factor(s) demand for houses and thus housing price may differ in different time periods over the years. Thus, the idea of this exploratory analysis is to observe the association between housing price and its related characteristics both with internal and external factors.

We observe that housing price is negatively impacted by the mortgage rate (see Table-2) during the time period considered in this study. However, the impact is much more for the two months lag than other time periods. Economic cycle has opposite (positive) impact on the housing price ($r = 0.051$, $p < 0.01$). Age of the property and the property price are negatively correlated both at first order ($r = -0.331$, $p < 0.000$) and second order ($r = -0.242$, $p < 0.000$). However, the rate of change decreases as the order increases, which is much visible in the regression model (see Table-3) and thus supporting our hypothesis of differences in housing price is due to differences in its characteristics that are time dependent. Similar but opposite results also observed between the relationship of housing price and the condition of the property ($r = 0.331$, $p < 0.000$).

The regression model that analyses the association of housing price with other factors has a coefficient of determination (R^2) is 0.25 with highly significant F value. Results indicate that age of the property in general impact the housing price negatively (see, Table 3). As for example, for each additional year the price of the house decreases about \$921.90 dollars. On the other hand, better condition of the property impacts housing price much more positively. Analysis also reveals that in good economic cycle houses are sold about \$7,358.91 more than in poor economic environment. There is some monthly seasonality also observed, however none of them were statistically significant.

In addition to the property characteristics, external factors also affect the housing price differently given that which time period they belong. Specifically, after controlling for lot size, bedrooms, bathrooms, square footage, etc., mortgage rate has impact on the price of the house negatively after two months delay. Another interesting finding is that economic cycle impact housing price differently at different time periods. For example, during 1998 and 1999 both the frequencies (quantities) and average price of houses were comparatively higher. A number of possible explanations can be explored for this time dependent quantity and price of houses. However, considering that most of the time series has some inherent serial correlation properties direct comparison may be complicated. Nonetheless, this study suggests that housing price is time dependent and more specifically the time effect is significantly substantial during good economic condition even after adjusted for inflation.

Table 3: Regression results of Sales Price on Internal/External Factors.					
Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	23	2.536255E12	1.102719E11	31.50	<.0001
Error	2208	7.72912E12	3500507115		
Corrected Total	2231	1.026537E13			
R-Square	0.2471		Adj R-Sq	0.2392	
Variables	DF	Parameter Estimates	Standard Error	t Value	Pr > |t|
Intercept	1	-391.10081	43013	-0.01	0.9927
MtgRate_Lag2	1	-2054.71089	1188.77212	-1.73	0.0841
Econ_Cycle	1	7358.90574	2767.20696	2.66	0.0079
Condition	1	119646	34976	3.42	0.0006
Bedrooms	1	6639.23710	11787	0.56	0.5733
Bathrooms	1	5801.81488	4757.86877	1.22	0.2228
Totbldgft	1	27.36675	3.27052	8.37	<.0001
Gsqft	1	26.73983	7.83324	3.41	0.0007
LotSqft	1	2.63922	0.32241	8.19	<.0001
Age	1	-921.90586	240.44101	-3.83	0.0001
AgeSq	1	7.67637	1.99204	3.85	0.0001
BedSq	1	-1696.04134	1700.98162	-1.00	0.3188
BathSq	1	-1102.29053	726.14302	-1.52	0.1292
FEB	1	-7637.12205	7840.85098	-0.97	0.3302
MAR	1	-4294.97492	7230.32434	-0.59	0.5526
APR	1	-7711.56225	7279.70209	-1.06	0.2896
MAY	1	-1783.92537	6588.65743	-0.27	0.7866
JUN	1	-3539.57184	6543.48015	-0.54	0.5886
JUL	1	-3256.49501	6527.49351	-0.50	0.6179
AUG	1	-2244.42051	6615.26948	-0.34	0.7344
SEP	1	119.46288	6863.64024	0.02	0.9861
OCT	1	-6787.02237	6797.18640	-1.00	0.3181
NOV	1	-1353.05201	6998.22811	-0.19	0.8467
DEC	1	1007.41377	7518.23227	0.13	0.8934

CONCLUSION

In this paper we study the complex nature of housing market dynamics and examine the factors' time dependent effect on the housing price. Specifically, we have observed statistical significance and magnitude of time dependent factors on the "selling price of a house". As expected, after controlling for lot sizes, bedrooms, bathrooms, square footage, etc., higher mortgage rate is found to be instrumental in affecting the housing price negatively with a two months delay and therefore unraveling some of the cross-correlation effect of market dynamics. This suggests that mortgage rate's influence on the housing value in this sub-population of

neighborhoods is time dependent. Therefore, the results indicate that in addition to the internal property characteristics, external factors also affect the housing price differently given that which time period they are considered. In particular, after adjusted for internal factors, mortgage rate impacts the price of the house negatively at two months lag. This specific lead-lag association between mortgage rate and housing price is an important finding of this paper. In addition, although the data indicate much variability in the property prices at different time periods, effect is substantially positive even after adjusted for inflation during economic accession. Therefore, we may conclude that after controlling for internal factors and adjusted for inflation, external factors affect the price of housing differently depending on the time period they exist. Thus, this research provides evidence for market participants and regulators to identify and understand some of the cross-correlation dynamics in the housing market environment and may be valuable to understand future possible economic turmoil.

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