

THE DIFFERENTIAL IMPACTS OF RECESSIONARY AND EXPANSIONARY
PERIODS ON THE INCOME OF INDIVIDUALS: THE IMPORTANCE OF
MARITAL STATUS, EDUCATIONAL ATTAINMENT, GENDER, AND RACE

A Thesis

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Shinhyun Park

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Abstract

of

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There is no doubt that recessions and expansions are economy wide phenomena; however, there is no reason to believe everyone will be affected equally. Differences in race, gender, region, marital status, educational attainment, and other individual characteristics are likely to help determine how people are affected by recessions and expansions. This paper examines differences across the mild recession of 2001, the severe recession of 2008 and the expansionary periods in between by constructing a panel data set of almost 40 million observations over the years 2000 to 2016.

One of the main findings of this thesis is that marital status and gender have large and statistically significant impacts on the incomes of individuals during recessionary and expansionary periods. The results show that although married individuals earn higher

incomes, the other marital status groups such as single, divorced, and separated people are affected less than others when the economy is in distress.

This research is not able to justify previous research that income varied more for men than for women during recessions, the results in this thesis show the opposite. That is, recessionary periods do not harm males more and, therefore, do not seem to be beneficial in reducing the gender wage gap. Instead, the size of gender differences seems to narrow only during expansionary periods.

In addition, this paper also shows that single individuals may be more economically disadvantaged during recessions. The findings in this study show that single, divorced, and separated people may have a slight advantage when compared to married individuals working in periods of both growth and decline. These results are consistent with the interpretation that single and separated people may be more desirable to employers when the economy is in distress because single people are more willing to do the same amount of work for lower pay. Without a spouse, they may have little choice but to continue to work.

Recessions and expansions also appear to have differential impacts based on educational attainment. The results shown here is consistent with previous literature that argue that education reduces the negative impacts of recession on income. The findings in this study show that income is not affected too heavily by the growth or decline in the economy but

worker with a high school diploma or an associate degree is more favorable in hiring standards during the recessionary periods. The results show that those with very little education, as well as those with post-graduate degrees, did slightly worse during the last recession compared to those with other levels of educational attainment.

Surprisingly, while the coefficients on the race and ethnicity variables are statistically different from zero, the magnitudes of the coefficients are generally small. When race is interacted with economic status, the coefficients are statistically significant, but not large for most groups. Many other personal characteristic variables, particularly marital status and educational attainment are more important in the regressions than race. That is, while the Great Recession of 2008 led to large declines in incomes, the negative impacts seem to have influenced every race fairly equally.

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Chapter 1: Problem Statement

The temporary economic declines in trade and activity during recessionary periods have been known to fracture employment sectors in ways that do not impact everyone equally. The differences we possess as individuals such as race and gender as well as some choices to establish a certain level of human capital contributes to different levels and responses in terms of income and employment. This thesis examines the effects of race, gender, educational attainment and marital status on the variation in individual incomes to gain a better understanding of which group is most affected during the recessionary and expansionary periods that occurred between the years 2000 and 2016.

During this time there were two different recessions and two periods of economic expansion. The 2001 recession was relatively minor with the unemployment rate peaking at only a little more than 6 percent. Most macroeconomists link the recession to the collapse of the dot.com bubble and Federal Reserve policies. Bubbles occur when the price of financial assets are driven above the expected present value of the future income stream of the investment. Irrational behavior and emotional reactions cause investors to put so much demand on an asset that they drive the price beyond a rational reflection of its actual worth. (Beattie n.d.) The decline in stock prices began when consumer confidence was shaken from the Y2K scare in 2000 (Amadeo 2018). The Federal Reserve ignored the market and continued raising interest rates, which further depressed the

economy and led many high-tech companies to experience difficulty borrowing funds. As a result, companies fell further into debt, leading to the bankruptcy and stock price collapses.

The magnitude of the “Great Recession,” which began in earnest with the collapse of the investment bank, Lehman Brothers, on September 15, 2008 was far greater than the previous recession in the early 2000s. Similar to the start of the earlier recession, the next American bubble began with a dramatic increase in housing prices. The housing boom coincided with an explosion in risky subprime lending and securitization. Housing prices began rising to unsustainable rates in addition to the widespread reports of predatory lending practices, dramatic increases in household mortgage debt, and exponential growth in financial firms trading activities. (The Financial Crisis Inquiry Commission 2011) The mortgage crisis began when high-risk mortgage borrowers could not make their loan payments, thus resulting in a loss of hundreds of billions of dollars in equity value for a large proportion of the U.S. economy. (Boswell 2013) The resulting loss of wealth from the housing crisis led to a collapse in business investment as well as consumer spending. During the downturn, employment declined by more than 8.8 million jobs, median household income fell around 8 percent from 2007 to 2009, and unemployment peaked at 10 percent in October 2009. (Goodman and Mance 2011)

By including both the minor recession in 2000 and 2001 and the major recession of 2007 to 2009, this study allows for a comparison of how different types of recessions

affected the various demographic groups emphasized in this study. The 2001 recession impacted the tech industry and dropped stock market prices, which potentially impacts a different group of people than the following recession. In addition to the differences in the causes of the recessions, the length of the 2001 recession was shorter and followed by a record long economic expansion, which eventually ended with the more severe 2008 recession. This study analyzes over 40 million observations over the years 2000 to 2016 to gain a better understanding of which groups are most impacted during the periods of economic growth and contractions. The comparison of the recessionary time periods will provide insight on how the severity of a recession will affect the differential impacts of income associated with gender, race, educational attainment, and marital status.

Chapter 2: Literature Review

There are many studies that examine the unequal distribution of income between men and women, across race/ethnicity categories and within the population in the United States. Some economists attribute the income discrepancy to the impacts of financial crises while others find importance in income disparity to promote economic growth. (Zakrevskaya and Mastracci 2013)

Earlier studies suggest that the effects of the recent downturn have been disproportionately dispersed based on levels of human capital attainment and differences in age, gender, and the race/ethnicity of an individual. The research done by Elsby, Hobijn and Sahin (2010) uses the unemployment rate from the Current Population Survey (CPS) to examine if variations in the unemployment rate can be explained by differences in gender, age, race and educational attainment. Their findings show little difference in unemployment cyclicalities due to age, race and education groups. The most impacted individuals during the Great Recession were male, younger, less educated workers, as well as individuals from ethnic minorities who experienced steeper rises in joblessness during all recessions. Being a member of a historically disadvantaged minority may negatively influence income due to discrimination in education, employment, housing, or credit markets.

The study by Garriga, Ricketts, and Schlaguenhuaf (2017) also examine the differential impacts across different racial and ethnic groups on new home mortgages in

the years leading up to the financial crisis. Their results suggest that the Great Recession was far more destructive for minorities in terms of foreclosure rates. The logit regressions used in their study to measure the likelihood of foreclosure grouped by race and ethnicities show a significant gap between minorities.

Aggregate delinquency and default rates for these groups were used to illustrate how homeownership fluctuated during the Great Recession based on differences across families by race, ethnicity, and income. According to the double-trigger hypothesis, the presence of the joint occurrence of a negative equity and a negative income shock to the household are the necessary conditions for a default decision. The exits from homeownership, particularly in areas populated by minorities, were driven mainly by mortgage delinquent/defaults on mortgage obligations. Mortgage defaults and delinquents are associated with income losses, and the losses in income associated to the interaction with race and economic status provide further evidence to explain the default decisions that led to the Great Recession.

Emmons and Noeth (2012) looked at how the Great Recession affected median net worth by race and age. They found that household financial stability was most vulnerable among those who were young or middle-aged, non-college educated, and those families belonging to a historically-disadvantaged minority group. Being a non-college graduate may affect income due to the lack of certain cognitive abilities or specific learned skills that are important in financial decision-making.

Zakrevskaya and Mastracci (2013) conducted an exploratory data analysis of the Federal Reserve's Survey of Consumer Finances (SCF) to capture the differential impacts of recessions on different types of households to better understand how different household types experienced the Great Recession. This study finds that those with more education faced smaller reductions on income, wealth, and net worth during the recession compared to those with less education.

In addition to race and education attainment, gender is another contributing factor in total personal income differences during the recessionary periods. Christensen's (2015) exploratory research on the Great Recession analyzed data from the Bureau of Labor Statistics and found that men faced steeper rises in unemployment during times of economic turmoil. This study contends that men were disproportionately represented in cyclically sensitive occupations during the initial layoffs during the recession. Similar studies, such as the Sahin, Song and Hobjin's (2010), find that steeper rise in unemployment for men can be traced to industry choices where male workers are concentrated (e.g., construction and durable goods manufacturing) are particularly sensitive to the cycle.

Marchand and Olfert (2013) used data from the Current Population Survey (CPS) to observe the effect of cyclicalities of wages for men and women during the Great Recession. The study found a downward shift in labor demand for men which increased the unemployment for men. Concurrently, the reduction in hourly wage was shown to be

greater for men than women, thereby possibly reducing the gender gap. They also reported that female labor participation rates increased during the 2008 recessionary period, perhaps due to the added worker effect which states that the loss of a job by one member of a household increases another member's willingness to supply labor. This finding is consistent with John and Potter (2007), who show that married women whose spouses lose their jobs or leave the labor force for some other reason, are more likely to enter the labor force than women whose spouses remain employed.

Other studies, such as the ones done by Engermann (2010), also address the disproportionate effects on men during the recession and focus the employment experiences across a range of other demographics such as marital status, race, age, and education. The research finds that employment for single individuals fell and grew at a faster rate than married individuals over the business cycle. Furthermore, married men and women saw smaller job losses than did their single counterparts, meaning that married women saw the smallest reduction in employment. The results suggest that the effects of motherhood contribute to the wealth gap in economic well-being.

Yamokoshi and Keister (2006) uses data from the National Longitudinal Survey of Youth 1979 cohort (NLSY) to construct several equations to also measure the influence of gender and marital status on incomes for single women. The study examines the effects of gender and marital status to find that marital status to be a very strong predictor of adult wealth. In comparison to married couples, single females and single

males are both economically disadvantaged. There is a slightly greater disadvantage brought by divorce for women, but both divorced men and women do far worse than married couples, and the gender difference for those divorced is minimal. Never-married and divorced mothers fare the worst in terms of median worth. The study finds only minimal gender gap in household wealth accumulations among single adults. Although this research does not provide insight on the effects during different economic periods, the findings provide insight on a possible negative coefficient on the interaction effects of single individuals.

The research conducted in this thesis adds to the literature in many different ways. While most other studies focused on employment status, homeownership, or wealth, my research examines the impact on total income. Second, instead of focusing on just one period, like the Great Recession, my research examines a much longer time period (2000 to 2016), which encompasses a mild recession (2000 and 2001), a severe recession (2007 to 2009) and two long expansionary periods in between. Third, in addition to observing the cyclicity in income for men, my research will interact the effects of gender, education, marital status and various year groups to investigate whether groups are affected differently during periods of recession and/or expansion.

Chapter 3: Methodology

This thesis uses the Integrated Public Use Microdata Series (IPUMS), which is a sample of almost 2 million people per year from the U.S. Census. A panel data set of over 40 million observations is created by pooling almost 2 million individuals surveyed each year for 16 years, from the year 2000 through the year 2016. This data set is well suited to examine the differential impacts of income during recessions and expansions in terms of race, gender, marital status, and educational attainment.

A fixed-effects regression model is used to estimate a linear regression model that minimizes the residuals between the observed responses and those predicted by the linear function in which the model parameters are fixed or non-random quantities. The analysis will allow an estimate of how much of the differences in total personal income is explained by the variables included in the regressions. I am able to control for age, race, family size, region, time and various levels of human capital accumulation to capture the variation in income that is explained by these factors. By including fixed effects (group dummies), the regression is able to control for average differences in any observable or unobservable predictors. The fixed effects coefficient soaks up all the across-group action. The left over effect is the within-group action associated with just the variation in what could be attributed to those unobservable predictors.

In addition to the fixed effects model, this research will also include interaction effects to observe the variation in the simultaneous effect of two or more independent

variables on the log of total personal income in which their joint effect is significantly (or significantly less) than the sum of the parts. The presence of interaction effects in any kind of research is important because it tells researchers how two or more independent variables work together to impact the dependent variable. Including interaction terms in an analytic model provides the researcher with a better representation and understanding of the relationship between the dependent and conjoint independent variables. It also can explain more of the variability in the dependent variable.

To control for heteroskedasticity, the regression analysis includes robust standard errors to obtain unbiased standard errors to account for the circumstances in which the variability of a variable is unequal across the range of values. Heteroscedasticity violates the Gauss Markov assumption, which states that a linear regression model in which the errors have equal variances. The inclusion of robust standard errors is a technique to obtain unbiased standard errors in order to be able to conduct hypothesis tests on individual coefficients in regression models.

In the regressions, total personal income is converted to real dollars using the consumer price index (CPI) from the Bureau of Labor Statistics, with income from all years measured in 2010 dollars. It is necessary to report income in real dollars to control for the impact of inflation (rising prices). If a household maintains the same money or nominal income for a decade without adjusting for inflation, then purchasing power for the household goes down at the end of the decade. For example, \$50,000 of money

income in the year 2016 buys fewer goods and services than \$50,000 of money income would have purchased in the year 2000. In contrast, the real estimates used in this thesis adjust for changes in prices over time to measure the purchasing power of income at different points in time.

Following Kim and Sakomoto's (2017) study, which uses log-transformed income as the dependent variable to estimate the effects for women in terms of return on education through marriage, I also use the natural log of real income in my research. This is conducive to examining the differential impacts in the variation of income during recessionary and expansionary periods that occurred between the years 2000 and 2016 because the coefficients on natural logarithms can easily be interpreted as percentage changes. Another advantage of reporting the dependent variable in the natural log form is to make the distribution of the transformed variable more symmetric (more normal). If there are outliers, a log transformation will reduce the influence of those observations and transform a non-linear model in the parameters into a linear model so that the Gauss-Markov assumptions associated with ordinary least squares (OLS) estimation have a better chance of being satisfied.

The coefficient for the control variables will capture the variation in income that is correlated to the differences in gender, age, region, family size, region, highest educational attainment, and labor force variables which include number of hours worked, number of weeks worked in the previous year, employment status, and indicators whether

the total personal income is earned from wages or from self-employment. The coefficient of the control variables associated with the variable will explain the percent change in income due to a unit change in the independent variables, holding all of the other explanatory variables constant.

The following variables: age, number of children, family size, and number of hours worked are included both in levels and squared to allow for possible nonlinear relationships. The main reason for the polynomial is to fit a relationship by a quadratic function and to identify maximum or a minimum. The maximum or minimum is the turning point at which the derivative changes signs meaning the income increases or decreases until a certain point then flips the other direction.

The inclusion of these variable is to capture some of the variation associated with the different levels of human capital, regional differences, and other individual differences not included in this study. One possibly relevant variable that this study does not include is the years of experience a person has working in a particular industry since this was not available through the CPS data gathered in this analysis. However, by including age and education attainment, it is hoped that differences and skills are adequately accounted for. It is the case, any omitted variables associated with experience and any other measures that are not captured in this research will increase the variation in the regression estimator and the coefficients could be biased.

The variables *mild recession*, *severe recession*, and *expansionary* are categorized by the information provided by the Federal Reserve Economic Data (FRED) to determine which years fall into the mild or severe recessionary periods and which years fall into the expansionary years. If the majority of the year fell into a recessionary period then the year was deemed a “recession” in the regression models. Similarly, if the majority of the year fell into an expansionary period then the year was included in the expansion group.

The *mild recession* variable includes the year 2001 and is used to capture the 2001 recession which was considered to be a slight collapse that lasted the duration of a full year. The dates of the early recession began in the fourth quarter of 2000 so we place the year 2000 as a part of the expansionary year. The earlier mild recession ended in the fourth quarter of 2001 (Federal Reserve Bank of St. Louis n.d.).

The *severe recession* variable includes the years 2008 and 2009 and is used to capture the Great Recession of 2008 recession, which lingered throughout most of 2009 as well. Since this was longer lasting and more catastrophic than the 2001 recession, this dummy variable for these two years is called *severe recession*. The Great Recession began in the third quarter of 2007 and ended in the third quarter of 2009 (Federal Reserve Bank of St. Louis n.d.).

The *expansionary* variable is categorized to include all years not already included in the recessionary grouping and excludes the year 2016 which is designated as the base period. The years categorized as expansionary are 2000, 2002 through 2007, and 2010

through 2015. The reference year for the variables measuring the different times of economic growth and contractions is the year 2016. This year was chosen as the reference year because the unemployment rate for the year 2016 was 4.5% which is close to the Federal Reserve's estimate of the natural unemployment rate of 4.5% to 5% (Federal Reserve Bank of St. Louis n.d.).

Chapter 4: Descriptive Statistics

The collection of observations ranges between the years 2001 and 2016 to observe the trends in income associated to changes in economic factors during the stock market crash of 2001, the housing market collapse in 2008 and the expansionary period after the recessions. All currency variables are reported in real 2010 dollars.

Table 1. Summary Statistics

Variables	Number of Observations	Mean	Std. Dev	Min	Max
Income	44,648,969	\$32,585.42	47,342.68	0	1,423,716
Log of Income	39,173,996	9.93	1.26	-0.16	14.17
Age	44,648,969	46.39	19.20	15	97
Family Size	44,648,969	2.83	1.61	1	31
Number of Children	44,648,969	0.65	1.05	0	9
Number of Hours Worked	44,648,969	24.96	21.25	0	99

Table 1 provides the number of observations, and the mean, standard deviation, minimum and maximum for income, log of income, age, family size number of children, and number of hours worked. The average individual in this sample size is around 46.39 years old working 25 hours earning \$32,585.42 with a child in their 3 person household.

The family size and the number of children are included in the model to measure the differences in income due to differences in the size of the household. The statistics show some extreme observations. For example, the largest family in the sample contains 31 individuals; however, the extremes in the number of children and the family size account for less than one percent of the entire sample size.

Table 2. Frequency Distribution and Descriptive Statistics

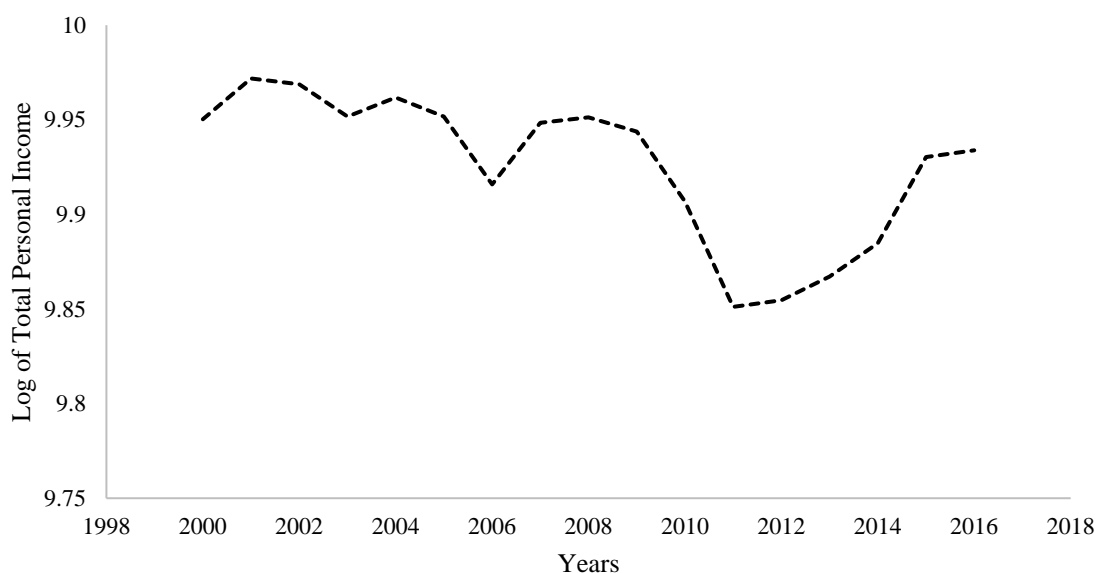
	% of sample	average income	average log of income
Entire Sample	100%	\$32,585.42	9.93
Education			
high school dropout	17.40%	\$11,322.46	9.07
high school diploma / GED	30.31%	\$23,542.94	9.74
associates	28.13%	\$30,437.95	9.92
bachelors	15.27%	\$52,392.26	10.46
post-baccalaureate	8.88%	\$77,852.91	10.86
Marital Status			
married	53.78%	\$41,013.39	10.20
separated	1.90%	\$26,537.78	9.76
divorced	10.23%	\$34,512.72	10.06
widowed	6.87%	\$25,600.01	9.80
single	27.22%	\$17,392.79	9.28
Race			
white	78.99%	\$34,798.89	9.98
black	9.96%	\$22,022.94	9.63
Asian	4.38%	\$34,967.34	10.01
mixed	1.90%	\$24,165.10	9.62
Native American	0.92%	\$20,286.77	9.52
other	3.85%	\$18,895.60	9.61
Sex			
male	48.06%	\$42,208.02	10.18
female	51.94%	\$23,682.95	9.68
Region			
northeast	18.60%	\$36,342.91	10.00
midwest	22.55%	\$30,952.01	9.89
south	36.27%	\$30,818.74	9.89
west	22.58%	\$33,959.65	9.97
Worked Last Year			
has not worked in last 5 years	27.84%	\$14,807.13	9.46
has not worked for 1-5 years	6.35%	\$14,728.90	9.39
worked last year	65.80%	\$42,681.97	10.11
Weeks Worked Last Year			

1-13 weeks	7.38%	\$11,448.57	8.07
14-26 weeks	6.25%	\$17,107.33	8.99
27-39 weeks	6.49%	\$23,949.74	9.54
40-47 weeks	7.05%	\$33,482.60	9.97
48-49 weeks	3.51%	\$42,495.09	10.22
50-52 weeks	69.32%	\$51,013.09	10.49
Class Worker			
self-employed	10.34%	\$53,592.97	10.16
works for wages	65.94%	\$36,973.32	9.99
government employed	23.32%	\$40,513.34	10.21
unpaid family worker	0.40%	\$18,166.26	8.95

Table 2 provides the frequency distribution and income variation of the groupings used in this study. The groupings include educational attainment, marital status, race, gender, region, and labor force indicator variables to later distinguish the marginal effects in total personal income. The Census report is used to verify the percentages of our groupings to ensure that the sample size used in the study are representative of the entire population. The Census for the population estimates that on July 1, 2017 88.4% of the population reported to have at least a high school diploma, while 12% of the population had obtained a post-bachelor's degree of some nature, and 50.8% are female, etc. (Ryan and Bauman 2016, United States Census Bureau 2017). These population percentages are close to the percentages in this sample, so it appears that the IPUMS sample is close to a random sample of the population. The variables education, age, race, sex and the average income were verified and can also be viewed as an accurate representation of the entire population.

Chapter 5: Empirical Analysis

Figure 1
Log of Total Personal Income



The dependent variable used in this research is the log of total personal income which reports each respondent's total pre-tax personal income or losses from all sources. Figure 1 shows the trend in total personal income over the years 2000 to 2016. The drop after 2008 is almost certainly due to the effects of the Great Recession. The official start of the Great Recession is the fourth quarter of 2007 and Figure 1 shows that the effects of the Great Recession appear to have affected individual incomes with a lag since most of the decreases do not occur until 2009 and 2010. There is a possibility that it took businesses that were struggling several months to a year to implement the layoffs and to

file for bankruptcy which could have prolonged the effects that individuals felt during this recession.

In addition to the measure of total personal income that is used as the dependent variable used in this study. Figure 2 provides the average income earned from wages and salaries over the years 2000 to 2016. Figure 3 provides the average income earned in the form of an estate or trust, interest, dividends, royalties, and rental income over the years used in this study.

Based on the trends provided in these figures we observe an interesting phenomenon during the period of the mild recession. The wage and salary income trend slopes upward while the trend for income earned from investments falls tremendously. Both trends slope downwards during the severe recession period; however, the magnitude of the drop in investment income is distinguishable.

Figure 2
Log of Wage and Salary Income

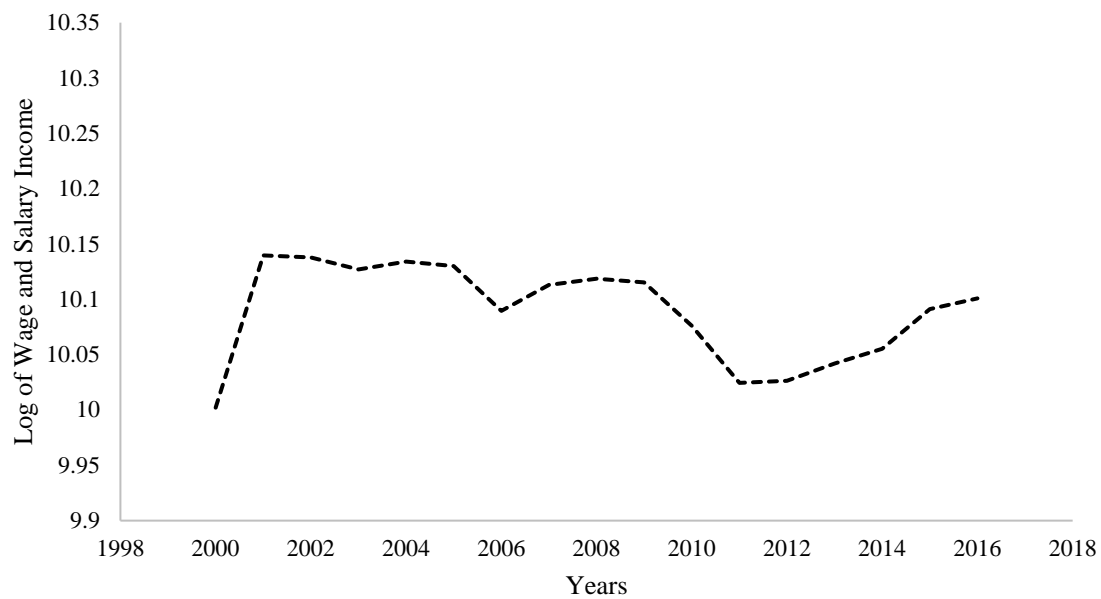


Figure 3
Log of Interest, Dividend, and Rental Income

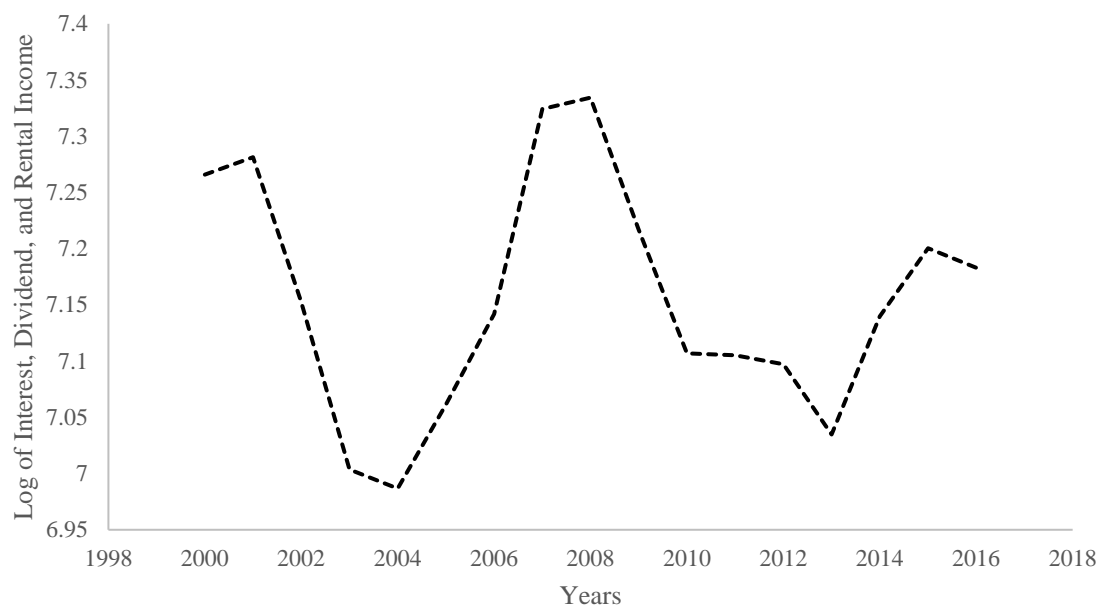


Figure 4
Male Log of Income

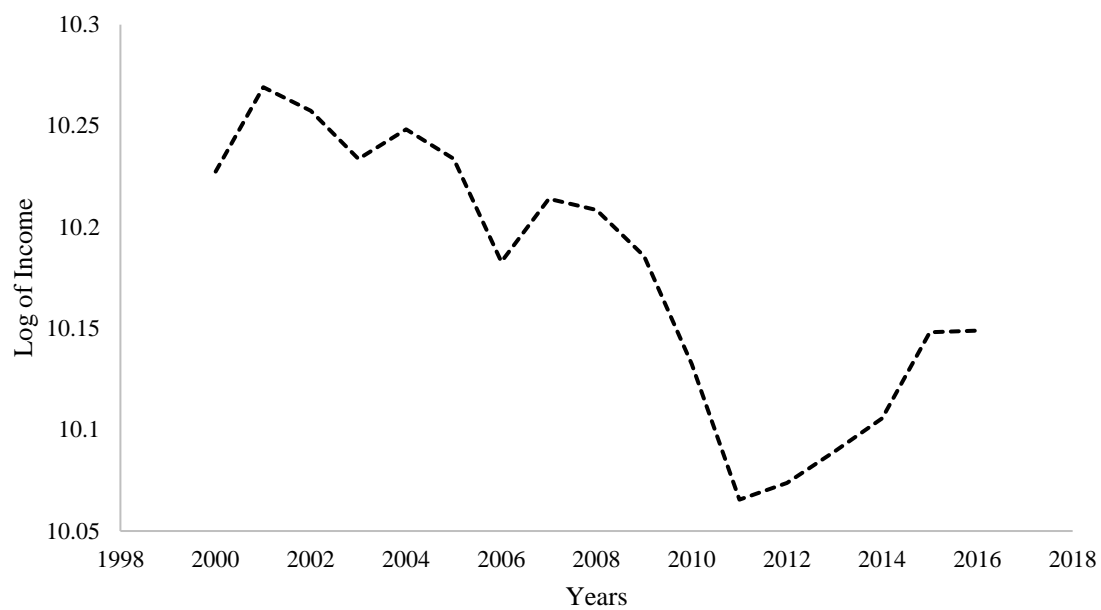


Figure 5
Female Log of Income

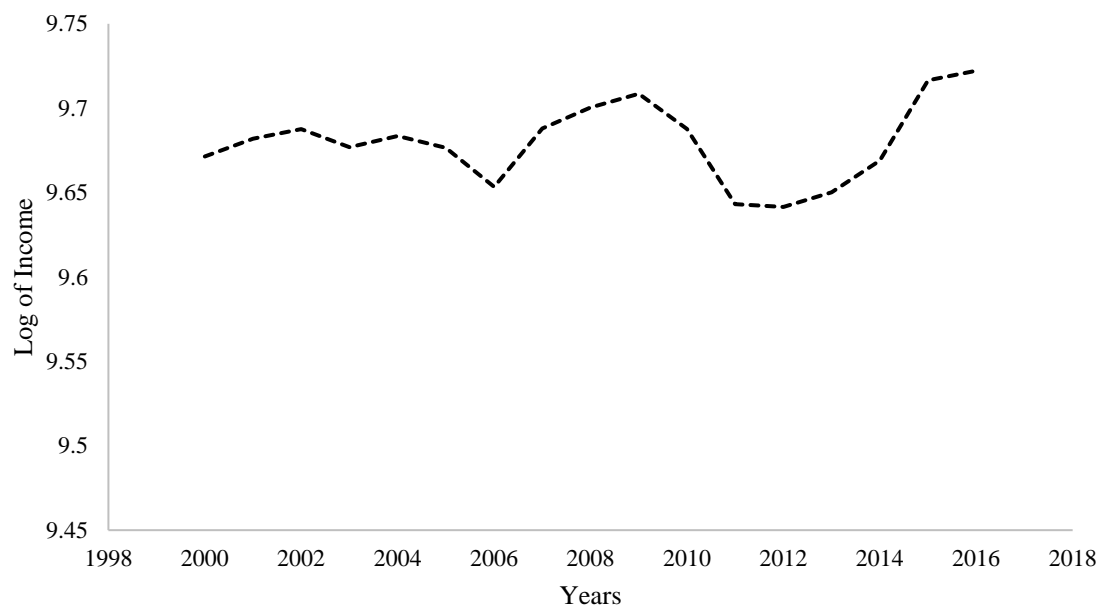


Figure 4 and 5 provides the income trend for the observations used in this study grouped by male and female gender categories. The visual depictions provide additional substance to the argument that employment trends for men are more cyclical and are consistent with Christensen's (2015) study, which analyzed unemployment rates and found that men face steeper rises in unemployment during times of economic turmoil. Marchand and Olfert (2013) also observe the effect of cyclicalities on wages for men and women during the Great Recession to find a downward shift in labor demand for men which increased the unemployment for men. They further predicted that the difference in cyclicalities could potentially reduce the gender gap.

Table III shows the results for an initial regression, without interaction terms, which shows that women make 49.85% less than men when other control variables are excluded.

Table 3. Gender and Year Interactive Regression

	Raw	No Labor Force Variables	Labor Force Variables
Main Effects			
a (constant)	10.1765*** (0.0003)	7.8659*** (0.0022)	7.7884*** (0.0018)
female (b ₁)	-0.4985*** (0.0004)	-0.4712*** (0.0014)	-0.3156*** (0.0012)
mild recession ¹ (b ₂)		0.1729*** (0.0017)	0.1286*** (0.0015)
severe recession ² (b ₃)		0.0696*** (0.0012)	0.0618*** (0.0010)
expansion ³ (b ₄)		0.0741*** (0.0010)	0.0640*** (0.0008)
Interaction Effects⁴			
female*mild recession (λ_1)		-0.1340*** (0.0026)	-0.0736*** (0.0021)
female*severe recession (λ_2)		-0.0518*** (0.0017)	-0.0393*** (0.0014)
female*expansion (λ_3)		-0.0626*** (0.0015)	-0.0349*** (0.00112)
Number of Observations	39,173,996	39,173,996	39,173,996
F-Stat	99,999	99,999	99,999
Prob > F	0	0	0
R-Squared	0.0393	0.3181	0.5581

Notes: (1) Mild recession refers to the year 2001. (2) Severe recession refers to the years 2008 and 2009. (3) Expansion refers to all other years: 2000, 2002-2006, and 2010-2016. (4) The coefficients are interpreted relative to the reference group, which is a male worker employed in the year 2010. Column 1 corresponds to Gender Raw Regression. Column 2 corresponds to Gender No Labor Force Variables Regression. Column 3 corresponds to Gender Labor Force Variables Regression.

The exclusion of labor force variables potentially will bias the coefficients tremendously since the simple regression in Column 1 of Table III does not account for differences in the number of hours of work between men and women or other labor market differences.

The regression reported in Column 2 above includes other demographic variables, such as race, education, family size, number of kids, age, time, and region fixed effects, while the regression in Column 3 also controls for labor market variables (see the Appendix).

With the exclusion of labor force variables in the regression in Column 2, the findings show female worker in the mild recession earn 13.40% less in the mild recession, 5.18% less during the Great Recession and 6.26% less during expansionary years when compared to the average male worker in 2016. The recession does seem to bridge the gap as Marchand and Olfert's (2013) study was able to prove with their study of unemployment rates. The *female*severe* recession and the *female*expansionary* coefficients provided in Column 2 and Column 3 of Table III are statistically significant; however, they are not economically significant in proving that there was a distinguishable difference during various economic periods. The large negative impact associated with the *female*mild recession* coefficient could be associated to a variety of reasons that is unknown based on the constraints and the endless possibilities that could potentially be behind the cause of impact.

When labor force variables such as employment status, number of hours worked, and number of weeks worked are included in the regression, I find that a female worker in the mild recession makes 7.36% less in the mild recession, 3.93% less in the severe recession, and 3.49% less during expansionary years when compared to the average male worker in 2010. The labor force variables absorb a lot of the income losses associated with changes in the status of employment. When labor force variables are included, the results only look at the effect on income during the different economic periods and recessionary periods that are the result of things that are not occurring in the labor market.

Figure 6
Log of Income by Marital Status

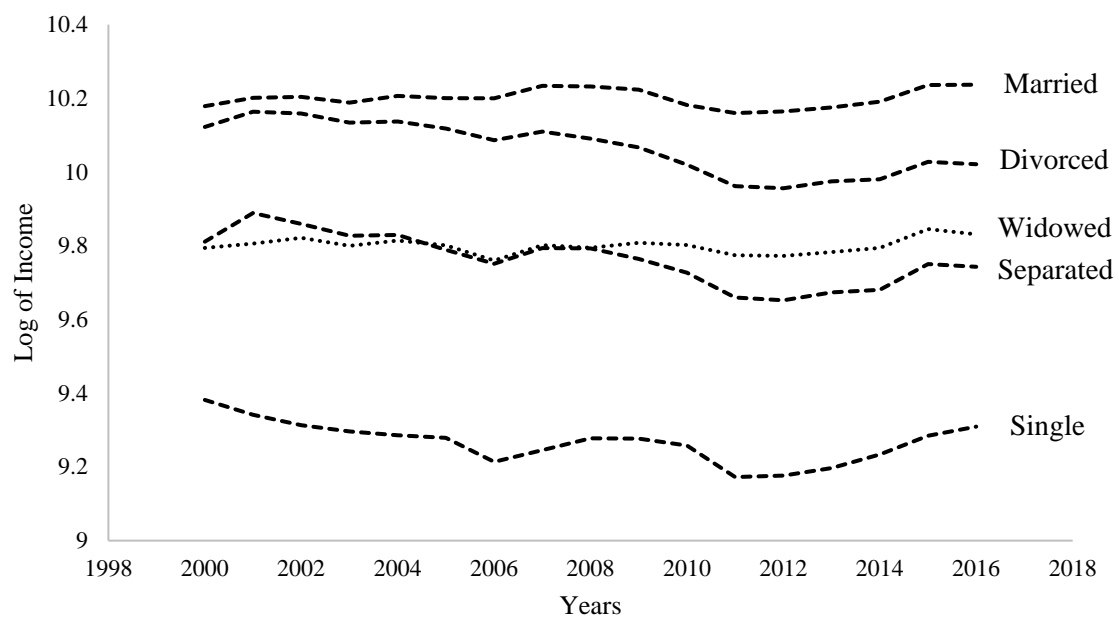


Table 4. Marital Status and Year Interaction Regression

	Raw	No Labor Force Variables	Labor Force Variables
Main Effects			
a (constant)	10.1969*** (0.0002)	7.9157*** (0.0022)	7.8220*** (0.0018)
single (b ₁)	-0.9152*** (0.0005)	-0.3724*** (0.0019)	-0.1987*** (0.0014)
widowed (b ₂)	-0.3993*** (0.0006)	0.1751*** (0.0025)	0.1454*** (0.0023)
separated (b ₃)	-0.4354*** (0.0013)	-0.2837*** (0.0054)	-0.1726*** (0.0043)
divorced (b ₄)	-0.1344*** (0.0003)	-0.1445*** (0.0022)	-0.0746*** (0.0018)
mild recession ¹ (b ₅)		0.051*** (0.0017)	0.0554*** (0.0014)
severe recession ² (b ₆)		0.0278*** (0.0011)	0.0302*** (0.0009)
expansion ³ (b ₇)		0.0212*** (0.0010)	0.0288*** (0.0008)
Interaction Effects⁴			
single*mild recession (θ ₁)		0.1594*** (0.0035)	0.1057*** (0.0027)
widowed*mild recession (θ ₂)		-0.0178*** (0.0043)	0.0233*** (0.0039)
separated*mild recession (θ ₃)		0.1815*** (0.0094)	0.1305*** (0.0076)
divorced*mild recession (θ ₄)		0.1385*** (0.0040)	0.0622*** (0.0033)
single*severe recession (θ ₅)		0.0310*** (0.0023)	0.0311*** (0.0017)
widowed*severe recession (θ ₆)		0.0024 (0.0043)	-0.0054** (0.0027)
separated*severe recession (θ ₇)		0.0674*** (0.0065)	0.0558*** (0.0052)

divorced*severe recession (θ_8)		0.0515*** (0.0027)	0.0245*** (0.0022)
single*expansion (θ_9)		0.0515*** (0.0019)	0.04667*** (0.0014)
widowed*expansion (θ_{10})		0.0029 (0.0026)	0.0106*** (0.0023)
separated*expansion (θ_{11})		0.0756*** (0.0056)	0.0707*** (0.0045)
divorced*expansion (θ_{12})		0.0571*** (0.0023)	0.0309*** (0.0019)
<hr/>			
Number of Observations	39,173,996	39,173,996	39,173,996
F-Stat	99,999	99,999	99,999
Prob > F	0	0	0
R-Squared	0.0908	0.3180	0.5580

Notes: (1) Mild recession refers to the year 2001. (2) Severe recession refers to the years 2008 and 2009. (3) Expansion refers to all other years: 2000, 2002-2006, and 2010-2016. (4) The coefficients are interpreted relative to the reference group, which is a widowed worker employed in the year 2010. Column 1 corresponds to Marital Status Raw Regression. Column 2 corresponds to Marital Status No Labor Force Variables Regression. Column 3 corresponds to Marital Status Labor Force Variables Regression.

Yamokoshi and Keister's (2006) findings of single females and males being economically disadvantaged is further validated by my results shown in Table IV. The raw regression in Column 1, with just the marital indicator variables as explanatory variables shows that those who are single have income that is 91.52% less than married individuals, while widowed make 39.93% less, separated make 43.54 % less, and divorced make 13.44% less.

When looking at the interaction of marital status and economic status, this study finds that single people could potentially benefit from times of economic distress. After controlling for demographic variables in Column 2, and demographic and labor market variables in Column 3, the results on the marital status variables are generally still statistically significant, by smaller in magnitude. In Column 2, the interactions between the state of the economy and marital status show total personal income for single individuals earn 15.94% more in the mild recession, 3.10% more in the severe recession, and 5.15% more in the expansionary years when compared to married individuals. Widowed individuals earn 1.78% less in the mild recession and this study could not prove that there was a statistical difference from being widowed when compared to married individuals during that severe recession and the expansion period. Separated participants perceived an 18.15% income increase in the mild recession, 6.7% increase in the severe recession, and 7.56 % increase in the expansion. Divorced observations earned 13.85% more in the mild recession, 5.15% more in the severe recession, and 5.71% more in the expansion. In addition to the literature provided previously which argued that

single people may be economically disadvantaged. The findings in this study portrays that single, widowed, divorced, and separated people may have a slight advantage when compared to married people working in 2016 in the different times of economic growth and decline.

In Column 3, with the inclusion of labor force variables, I find that the economic significance is slightly smaller, with single individuals earning 10.57% more in the mild recession, 3.11% more in the severe recession, and 4.67% more in the expansion. Being widowed has a 2.33% positive impact in the mild recession, 0.54 % negative impact in the severe recession, and 1.06% positive impact in the expansion. Separated observations earn 13.05% more in the mild recession, 5.58% more in the severe recession, and 7.07% more in the expansion period. Divorced observations earned 6.22% more in the mild recession, 2.45% more in the severe recession, and 3.09% more in the expansion.

The percentage changes associated from the difference in marital status and economic status allows us to imply that the changes in income is associated to the variation in hours worked, weeks worked, employment status and labor force participation status. The results may imply that single, separated, and divorced people may be more desirable to employers when the economy is in distress because maybe single people are more willing to do the same amount of work for a lower pay because they can afford to take a smaller pay if they do not have dependents. They may also have to continue to work regardless of the economic times without the additional income provided by a spouse.

Figure 7
Log of Income by Race

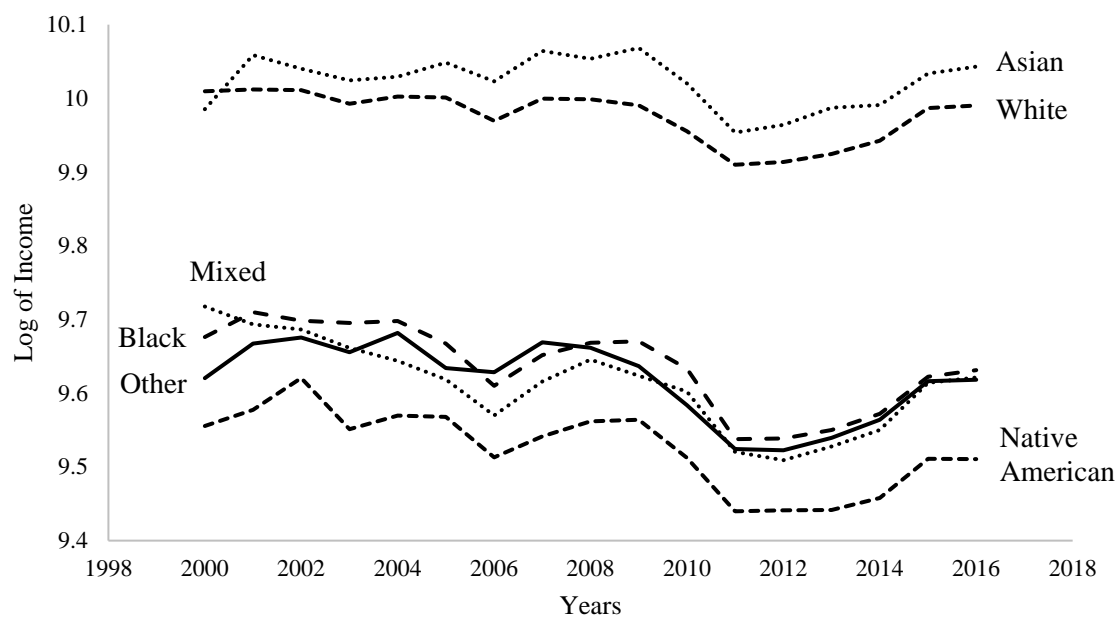


Table 5. Race and Year Interaction Regression

	Raw	No Labor Force Variables	Labor Force
Main Effects			
a (constant)	9.9794*** (0.0002)	8.0761*** (0.0020)	7.8098*** (0.0017)
black (b ₁)	-0.3457*** (0.0007)	-0.1626*** (0.0025)	-0.1139*** (0.0020)
Asian (b ₂)	0.0349*** (0.0011)	-0.0763*** (0.0036)	-0.0962*** (0.0029)
Native American (b ₃)	-0.4599*** (0.0022)	-0.2203*** (0.0077)	-0.1375*** (0.0061)
mixed (b ₄)	-0.3553*** (0.0017)	-0.1345*** (0.0055)	-0.0713*** (0.0042)
other (b ₅)	-0.3660*** (0.0010)	-0.0189*** (0.0040)	-0.1470*** (0.0030)
mild recession ¹ (b ₆)		0.0967*** (0.0014)	0.0832*** (0.0012)
severe recession ² (b ₇)		0.0377*** (0.0010)	0.0381*** (0.0008)
expansion ³ (b ₈)		0.0397*** (0.0008)	0.0417*** (0.0007)
Interaction Effects⁴			
black*mild recession (α_1)		0.0822*** (0.0047)	0.0589*** (0.0037)
Asian*mild recession (α_2)		0.0072 (0.0074)	0.0216*** (0.0059)
Native American*mild recession (α_3)		0.0013 (0.016)	0.0238* (0.0125)
mixed*mild recession (α_4)		0.0418*** (0.0110)	0.0200** (0.085)
other*mild recession (α_5)		0.0214*** (0.0078)	0.0598*** (0.0058)
		0.0434*** (0.0030)	0.0256*** (0.0024)

black*severe recession (α_6)		0.0020 (0.0045)	-0.0090** (0.0036)
Asian*severe recession (α_7)		0.0360*** (0.0098)	0.0270*** (0.0077)
Native American*severe recession (α_8)		0.0159** (0.0070)	0.0099* (0.0054)
mixed*severe recession (α_9)		0.0358*** (0.0041)	0.0448*** (0.0037)
other*severe recession (α_{10})		0.0286*** (0.0025)	0.0350*** (0.0020)
black*expansion (α_{11})		-0.0227*** (0.0038)	-0.0145*** (0.0030)
Asian*expansion (α_{12})		0.0025 (0.0080)	0.0159** (0.0064)
Native American*expansion (α_{13})		0.0032 (0.0057)	-0.0027 (0.0044)
mixed*expansion (α_{14})		0.0348*** (0.0041)	0.0628*** (0.0031)
other*expansion (α_{15})		-0.0392*** (0.0056)	-0.0103*** (0.0043)
Number of Observations	39,173,996	39,173,996	39,173,996
F-Stat	88,771	99,999	99,999
Prob > F	0	0	0
R-Squared	0.0108	0.3179	0.5580

Notes: (1) Mild recession refers to the year 2001. (2) Severe recession refers to the years 2008 and 2009. (3) Expansion refers to all other years: 2000, 2002-2006, and 2010-2016. (4) The coefficients are interpreted relative to the reference group, which is an “other” race worker employed in the year 2010. Column 1 corresponds to Race Raw Regression. Column 2 corresponds to Race No Labor Force Variables Regression. Column 3 corresponds to Race Labor Force Variables Regression.

The study on differential impacts across different racial and ethnic groups by Garriga, Ricketts, and Schlaguenhuaf (2017) has suggested that the Great Recession was far more destructive for minorities when comparing measures of mortgage foreclosures. This study attempts to further explain the story behind the mortgage foreclosures by looking at the income differences during these time periods to possibly explain why minorities experienced higher rates of mortgage foreclosures.

Being a member of a historically disadvantaged minority may negatively influence income due minority households having faced discrimination in education, employment, housing, or credit markets (Elsby, Hobijn and Sahin 2010). The first column of regression results provide the raw differences in income associated to race categories. Compared to those who are categorized in the White American group, Black Americans earn 34.57% less, while Asian Americans earn 3.49% more, Native American earn 45.99% less, those with two or more races or mixed earn 35.53% more, and those who described themselves to be in the “other race” category earn 36.60% less.

After controlling for demographic variables in Column 2, and demographic and labor market variables in Column 3, the results on the race variables are generally still statistically significant. In Column 2, the interactions between the state of the economy and race show total personal income for Black Americans to earn 8.22% more in the mild recession, 4.34% more in the severe recession, and 2.86% more in the expansion. Asian Americans earn 2.27% less in the expansion and this study could not prove that there was

a difference in income for Asian Americans when compared to White Americans during the mild and severe recession. Native American earn 3.60% more in the severe recession and this study could not significantly prove that there was a difference in pay due to the mild recession and the expansion period. Individuals who claimed two or more races or mixed earn 4.18% more in the mild recession, 1.59% more in the severe recession, and I could not significantly prove that there was a difference in pay due to the expansion. The “other race” group experienced a 2.14% increase in the mild recession, 3.58% increase in the severe recession, and 3.48% increase in the expansion.

When labor force variables are included, Black Americans earn 5.89% more in the mild recession, 2.56% more in the severe recession and 3.50% more in the expansion. Asian Americans earn 2.16% more in the severe recession, 0.90% less in the severe recession, and 1.45% less in the expansion. Native Americans earn 2.38% more in the mild recession, 2.70% more in the severe recession and 1.59% more in the expansion. Individuals who claimed two or more races or mixed earn 2% more in the mild recession, 0.99% less in the severe recession, and there is no significance that there was a difference in pay due to the expansion. The “other race” group earns 5.98% more in the mild recession, 4.48 % more in the severe recession, and 6.28% more in the expansion.

Although the Garriga, Ricketts, and Schlaguenhuaf (2017) claim that the Great Recession was far more destructive for minorities based on income distributions, the research in my paper does not seem to provide the results to accurately claim that

mortgage foreclosures were more predominate for minorities due to income discrepancies. The results show that the minorities seem to experience an overall benefit during economically distressed times. When labor force measures are not accounted for Black Americans and Native American experience a significant income increase during the severe and mild recession. When labor force variables are accounted for it appears that Black Americans and those who identify in the “other race” category experiences a significant increase in income during the severe recession.

Overall, the coefficients for interacting race and economic status provides statistical significance; however, the economic significance levels of the race categories are not drastic enough to claim that the changes in income is not significantly affected by the interaction of race and economic status. The catastrophic recession seems to have influenced every race fairly equally. The disadvantage that minorities face may be associated to the individual interaction of race on income which could signify institutional discrepancies associated with race; however, the interaction of different times of the economy do not seem to weigh heavily on income.

Figure 8
Log of Income by Educational Attainment

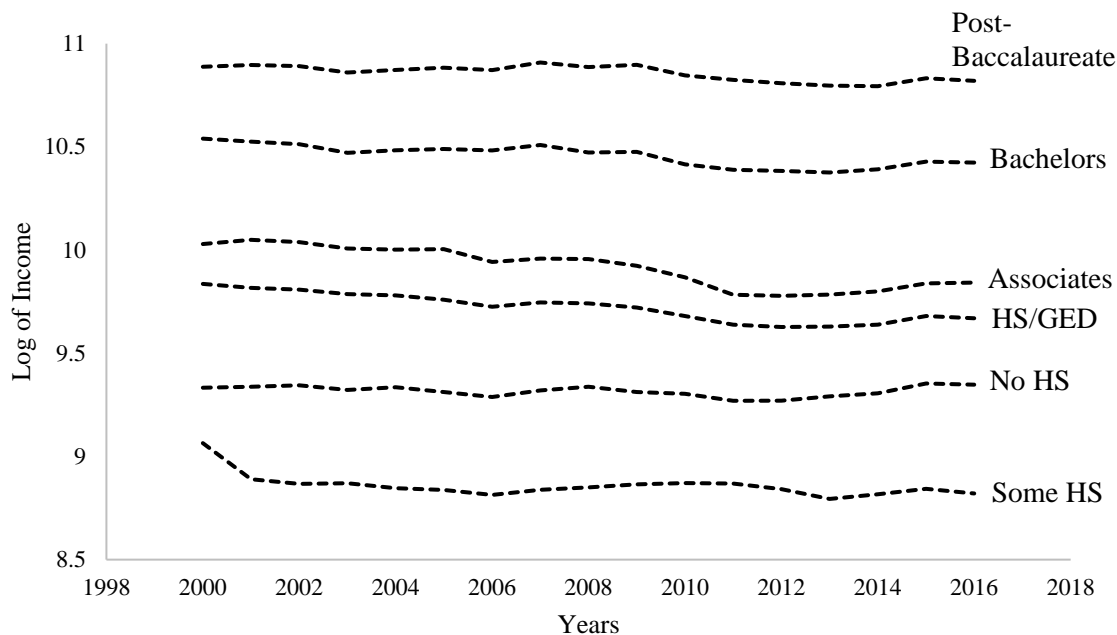


Figure 5 shows a lack of movement in the log of total personal income grouped by education. The frequency measuring the number of individuals who obtain specific degrees in a given year are not observed here. Instead, only total educational attainment is included. While it is well known that income rises with educational attainment, it is unclear how educational attainment may influence year-to-year changes in income associated with recessions and expansions. There is also the possibility of some endogeneity in that previous literature has suggested that people are more willing to go back to school during recessionary periods. By controlling for the presence or absence from the labor market in my regressions, it is likely that this is possible endogenous response is largely controlled for.

Table 6. Education and Year Interaction Regression

	Raw	No Labor Force Variables	Labor Force Variables
Main Effects			
a (constant)	9.0726*** (0.0006)	7.8929*** (0.0030)	7.7967*** (0.0024)
diploma (b ₂)	0.6632*** (0.0007)	0.4562*** (0.0027)	0.2490*** (0.0022)
associates (b ₃)	0.8470*** (0.0007)	0.6596*** (0.0027)	0.4240*** (0.0022)
bachelors (b ₄)	1.3891*** (0.0007)	1.1517*** (0.0029)	0.7930*** (0.0024)
post (b ₅)	1.7833*** (0.0008)	1.4578*** (0.0031)	1.0919*** (0.0026)
mild recession ¹ (b ₆)		0.0669*** (0.0038)	0.0876*** (0.0031)
severe recession ² (b ₇)		0.0228*** (0.0028)	0.0307*** (0.0022)
expansion ³ (b ₈)		0.0495*** (0.0024)	0.0584*** (0.0019)
Interaction Effects⁴			
diploma*mild recession (δ ₂)		0.0546*** (0.0044)	0.0166*** (0.0036)
associates*mild recession (δ ₃)		0.0955*** (0.0045)	0.0243*** (0.0036)
bachelors*mild recession (δ ₄)		0.0043 (0.0050)	-0.0056 (0.0041)
post*mild recession (δ ₅)		-0.0536*** (0.0056)	-0.0628*** (0.0047)
diploma*severe recession (δ ₇)		0.0194*** (0.0032)	0.0157*** (0.0026)
associates*severe recession (δ ₈)		0.0503*** (0.0032)	0.0248*** (0.0026)
bachelors*severe recession (δ ₉)		0.0001 (0.0035)	0.0010 (0.0028)

post*severe recession (δ_{10})		0.0101*** (0.0038)	0.0008 (0.0031)
diploma*expansionary (δ_{12})		0.0034 (0.0027)	-0.0016 (0.0022)
associates*expansionary (δ_{13})		0.0137*** (0.0028)	-0.0026 (0.0022)
bachelors*expansionary (δ_{14})		-0.0322*** (0.0030)	-0.0250*** (0.0024)
post*expansionary (δ_{15})		-0.0535*** (0.0032)	-0.0531*** (0.0027)
Number of Observations	39,173,996	39,173,996	39,173,996
F-Stat	99,999	99,999	99,999
Prob > F	0	0	0
R-Squared	0.1535	0.3180	0.5580

Notes: (1) Mild recession refers to the year 2001. (2) Severe recession refers to the years 2008 and 2009. (3) Expansion refers to all other years: 2000, 2002-2006, and 2010-2016. (4) The coefficients are interpreted relative to the reference group, which is a worker with no high school education employed in the year 2010. Column 1 corresponds to Education Raw Regression. Column 2 corresponds to Education No Labor Force Variables Regression. Column 3 corresponds to Education Labor Force Variables Regression.

The results provided in this study are contradictory with the findings of Zakrevskaya and Mastracci's (2013) that education reduces the negative impacts of recession on income. A college education increases the value of human capital obtained by individual by increasing technical skills utilized in the work force or learning cognitive abilities that are important in financial decision-making. The omitted variable for the educational measures is the "high school dropout" group which signifies that the highest year of school or degree completed was less than 12th grade.

The raw regression in Column 1, with the log of total personal income only regressed on the highest education attainment variables, and the demographic and labor market variables excluded, shows that those with only a high school diploma or GED has income 66.32% more than a high school dropout. Someone who has an associate degree increases their income by 84.70% more, a bachelor's degree 138.91% more, and a post-baccalaureate degree 178.33% more than someone without any high school diploma.

When demographic variables are included, but not labor market variables, in the regression reported in Column 2, the results show that someone with a high school diploma or GED earns 5.46% more in the mild recession, 1.94 % more in the severe recession, and not statistically significantly difference in the expansion. An associate degree holder earns 9.55% more in the mild recession, 5.03% more in the severe recession, and 1.37% more in the expansion. An individual with a bachelor's degree earns 3.22% less in the expansion and the results could not statistically prove that there

was a difference in pay during the mild recession and severe recession. A post-baccalaureate degree impacts earnings by 5.36% less in the mild recession, 1.01% more in the severe recession, and 5.35% less in the expansion.

When labor force variables are included an individual with a high school diploma or GED earns 1.66% more in the mild recession, 1.57% more in the severe recession, and not statistically significant in the expansion period. An associate degree earns 2.48% more in the mild recession and the results could not significantly prove that there was a difference in pay due to the severe recession and the expansionary period. A bachelor's degree earns 2.50% less in the expansion period and the results could not prove statistically find that the mild and severe recession influenced the income. A post-baccalaureate degree earns 6.28% less in the mild recession, 5.31% less in the expansion period, and the data was not statistically different from the income of high school dropouts during the severe recession.

With the inclusion of the labor force variables, the interaction in education and the status of the economy does not seem to influence income too heavily. Surprisingly there were a lot of statistically insignificant coefficients when observing the change in income by educational attainment during the different periods of the economy. The results could not prove that more educational attainment provided additional income stability but the lack in change can also signify that income from educational attainment is not so easily

influenced by changes in the economy thus provides the ultimate stability in income differences.

In addition to not being able to statistically prove that the difference from having a bachelor's degree over a high dropout during the two recessions, this study also found a negative impact for post-graduate degree holders. The results show that those with very little education, as well as those with post-graduate degrees, did slightly worse during the last recession compared to those with other levels of educational attainment.

The drastic change from the inclusion of labor force variables for the high diploma/GED and associate degree holders is an indication that the variation between the coefficients of the two regressions is reflecting the employment status changes. It looks like income is not affected too heavily but an associate degree and high school diploma holders may be more in hiring standards is more favorable during the recessionary periods.

Chapter 6: Conclusion

While there is large literature examining the cause of differences in income across individuals, there are very few studies that interact demographic and labor market variables with the state of the economy to look at how income changes over the business cycle. This thesis focuses on how differences in marital status, race, and educational attainment affect how people fare in mild recessions, severe recessions, and economic expansions. In some cases, the results in this thesis supports those reported by other studies in the recent years, but some of the findings from the conventional wisdom.

While Christensen (2015) and Marchand and Olfert (2013) claim that income varied more for men than for women during recessions, the results in this thesis show the opposite. That is, recessionary periods do not harm males more and, therefore, do not seem to be beneficial in reducing the gender wage gap. Instead, the size of gender differences seems to narrow only during expansionary periods.

My results are also contrary to Yamokoshi's (2006) study that found single females and males were economically disadvantaged. The results in this thesis show that being married had the slight disadvantage during times of economic turmoil and single people actually could potentially benefit from times of economic distress. The raw results show that single people are disadvantaged in general; however, that regression does not take into human capital factors and individual characteristics that play a significant role

in income variation. Once these are accounted for, the penalty for being single goes away.

This thesis also is different from what Garriga, Ricketts, and Schlaguenhuaf (2017) report for homeownership rates for minorities during the Great Recession, where minorities suffered more as a result of the housing collapse. While my results are not directly comparable to their results, a differential impact on incomes is not evident in my regression. Although minority groups certainly have lower levels of income, my results suggest that incomes for minorities did not decrease more in recessions than they did for other groups.

The differential impacts associated with race did not seem to vary too much based on the different economic recessions and expansions. The lack of variation due to the interaction of race and economic status could be associated to the greater influence of race individually on income. Which could be associated with structural discrimination which results from being a member of a historically disadvantaged minority that can experience a negative influence on income because many minority households have faced discrimination in education, employment, housing, or credit markets.

The interaction of educational attainment and the status of the economy further justifies Zakrevskaya and Mastracci's (2013) claim that education reduces the negative impacts of recession on income. A college education increases the value of human capital obtained by individual by increasing technical skills utilized in the work force or learning

cognitive abilities that are important in financial decision-making. The changes associated with the educational attainment on the status of the economy is correlated with the labor force variables that were included and excluded from the regression. High school diploma/GED and associate degree holders seem to have the most favorable increases in employment status during times of economic distress.

This paper finds marital status and gender to be a significant factor resulting in significant marginal impacts. Educational attainment seems to reflect a diminishing return to investment especially during times of economic growth. This thesis also did not find reason to believe race influences income too heavily in different economic periods.

Appendix A

To correct for inflation the total personal income variable is converted to real dollars using the base year 2010. The CPI for the conversion is from the Bureau of Labor Statistics website: https://www.bls.gov/data/inflation_calculator.htm.

The main empirical specification used in the Tables reported in the thesis is:

$$\begin{aligned}
Y_{it} = & \beta_0 + \beta_1 \text{Female}_{it} + \beta_2 \text{White}_{it} + \beta_3 \text{Black}_{it} + \beta_4 \text{NativeAmerican}_{it} + \beta_5 \text{Asian}_{it} + \\
& \beta_6 \text{OtherRace}_{it} + \beta_7 \text{Mixed}_{it} + \beta_8 \text{SomeHighSchool}_{it} + \beta_9 \text{HighSchoolGED}_{it} + \\
& \beta_{10} \text{Associates}_{it} + \beta_{11} \text{Bachelors}_{it} + \beta_{12} \text{Post-Baccalaurate}_{it} + \beta_{13} \text{Single}_{it} + \\
& \beta_{14} \text{Married}_{it} + \beta_{15} \text{Divorced}_{it} + \beta_{16} \text{Employed}_{it} + \beta_{17} \text{Unemployed}_{it} + \\
& \beta_{18} \text{HoursWorked}_{it} + \beta_{19} \text{PastWorkedYr}_{it} + \beta_{20} \text{YesWorkedYr}_{it} + \\
& \beta_{21} \text{WksWork14_26}_{it} + \beta_{22} \text{WksWork27_39}_{it} + \beta_{23} \text{WksWork40_47}_{it} + \\
& \beta_{24} \text{WksWork48_49}_{it} + \beta_{25} \text{WksWork50_52}_{it} + \beta_{26} \text{SelfWkr}_{it} + \beta_{27} \text{WageWkr}_{it} + \\
& \beta_{28} \text{UnpaidWkr}_{it} + \beta_{29} \text{Age}_{it} + \beta_{30} \text{FamilySize}_{it} + \beta_{31} \text{NumberOfChildren} + \\
& \beta_{32} \text{Year}_{it} + \beta_{33} \text{Northwest}_{it} + \beta_{34} \text{Midwest}_{it} + \beta_{35} \text{South}_{it} + \\
& \sum_{i=1,t=1} \lambda_{it} (\text{GroupYear}_{it} \times \text{Female}_{it}) + \\
& \sum_{i=1,t=1} \delta_{it} (\text{GroupYear}_{it} \times \text{SomeHighSchool}_{it}) + \\
& \sum_{i=1,t=1} \delta_{it} (\text{GroupYear}_{it} \times \text{HS/GED}_{it}) + \\
& \sum_{i=1,t=1} \delta_{it} (\text{GroupYear}_{it} \times \text{Associates}_{it}) + \\
& \sum_{i=1,t=1} \delta_{it} (\text{GroupYear}_{it} \times \text{Bachelors}_{it}) + \\
& \sum_{i=1,t=1} \delta_{it} (\text{GroupYear}_{it} \times \text{PostBaccalaurate}_{it})
\end{aligned}$$

$$\begin{aligned}
& \sum_{i=1,t=1} \theta_{it}(\text{GroupYear}_{it} \times \text{Single}_{it}) + \\
& \sum_{i=1,t=1} \theta_{it}(\text{GroupYear}_{it} \times \text{Married}_{it}) + \\
& \sum_{i=1,t=1} \alpha_{it}(\text{GroupYear}_{it} \times \text{White}_{it}) + \\
& \sum_{i=1,t=1} \alpha_{it}(\text{GroupYear}_{it} \times \text{Black}_{it}) + \\
& \sum_{i=1,t=1} \alpha_{it}(\text{GroupYear}_{it} \times \text{NativeAmerican}_{it}) + \\
& \sum_{i=1,t=1} \alpha_{it}(\text{GroupYear}_{it} \times \text{Asian}_{it}) + \\
& \sum_{i=1,t=1} \alpha_{it}(\text{GroupYear}_{it} \times \text{OtherRace}_{it}) + \mu_i
\end{aligned}$$

The dependent variable, denoted as Y_{it} above, is the natural logarithm of (INCTOT Total Personal Income) in IPUMS, which reports each respondent's total pre-tax personal income or losses from all sources for the previous year. The full description can be found at the link:

https://usa.ipums.org/usa-action/variables/INCTOT#description_section.

The IPUMS USA variable SEX is used to create a dummy variable representing the gender of the respondent. This paper will use the categorical variable $Female_{it}$ to represent the female population, with females denoted as “1” and males as “0”.

https://usa.ipums.org/usa-action/variables/SEX#description_section

Age_{it} is captured through IPUMS USA variable AGE which reports the person's age in years as of the person's last birthday.

https://usa.ipums.org/usa-action/variables/AGE#description_section

NumberOfChildren_{it} is captured using IPUMS USA variable NCHILD which counts the number of own children residing with each individual. NCHILD includes step-children and adopted children as well as biological children.

https://usa.ipums.org/usa-action/variables/NCHILD#description_section

FamilySize_{it} is captured through IPUMS USA variable FAMSIZE which counts the number of own family members residing with each individual, including the person her/himself.

https://usa.ipums.org/usa-action/variables/FAMSIZE#description_section

Race_{it} is measured through 5 separate variables categorized as White, Black, Native American, Asian, other race and mixed which is defined as two or more major races. The omitted category is other race.

https://usa.ipums.org/usa-action/variables/RACE#description_section

The variables capturing the level of educational attainment is obtained from IPUMS USA variable EDUC, which indicates respondents' educational attainment, as measured by the highest year of school or degree completed. The highest educational attainment is measured by creating six dummy variables categorized by no high school education, some high school education, high school diploma or GED, associate's degree,

bachelor's degree and post-baccalaureate degree. The B_{it} associated with a bachelor's degree will measure either the increase or decrease in the percentage of income due to obtaining a bachelor's degree in comparison to the average individual without a high school education.

https://usa.ipums.org/usa-action/variables/EDUC#description_section

Marital status is obtained from IPUMS USA using the variable MARST which gives each person's current marital status. The marital status of the observations is captured through five indicators of measurement to capture if the individual is single, married, widowed, divorced, or separated. The coefficients associated with these indicators will measure the percent change in income associated to the variation in marital status in comparison to the omitted category of being widowed.

https://usa.ipums.org/usa-action/variables/MARST#description_section

Employment status is measured using IPUMS USA's variable EMPSTAT which indicates whether the respondent was a part of the labor force (working or seeking work) and, if so, whether the person was currently unemployed. Employment status is included as an indicator variable that represents whether the respondent was a part of the labor force and, if so, whether the person was currently employed. The vector includes three groups: employed, unemployed, and not in labor work force. The omitted category is not in labor workforce.

https://usa.ipums.org/usa-action/variables/EMPSTAT#description_section

UHRSWORK is abstracted from IPUMS USA to report the number of hours per week the respondent usually worked, if the person worked during the previous year.

HoursWorked_{it} is the usual hours worked per week. The squared variable is included to observe a nonlinear trend associated with the number of hours worked per week.

https://usa.ipums.org/usa-action/variables/UHRSWORK#description_section

The variable WORKEDYR from IPUMS USA is used to create the dummy variables *PastWorkedYr_{it}* and *YesWorkedYr_{it}* which indicates whether the person had worked at all for profit, pay, or as an unpaid family worker during the previous year. The omitted variable is not having worked in over 5 years. *PastWorkedYr_{it}* represents the sample who did not work the previous year but has worked 1-5 years ago. *YesWorkedYr_{it}* represents the sample who has worked the previous year.

https://usa.ipums.org/usa-action/variables/WORKEDYR#description_section

WKSWORK2 from IPUMS USA reports the number of weeks that the respondent worked for profit, pay, or as an unpaid family worker during the previous year. *WksWork_{it}* is represented as an indicator variable that reports the number of weeks that the respondent worked for profit, pay or as an unpaid family worker during the previous year. The omitted variable is having worked 1-13 weeks.

https://usa.ipums.org/usa-action/variables/WKSWORK2#description_section

The IPUMS USA variable CLASSWKR indicates whether respondents worked for their own enterprise(s) or for someone else as employees. $SelfWkr_{it}$, $WageWkr_{it}$, and $UnpaidWkr_{it}$ are indicator variables to classify the class of worker the respondent represents. Workers with multiple sources of employment were classified according to the work relationship in which they spent the most time during the reference day or week. The omitted variable was government employees.

https://usa.ipums.org/usa-action/variables/CLASSWKR#description_section

$Year_{it}$ is a vector of eleven years starting from 2000 to 2016. The year 2010 is used as the omitted category as a representative year of when the Real Potential Gross Domestic Product (GDP) is closely aligned to the Real GDP. Potential GDP is the level of real GDP the economy would produce if it were at full employment. When the labor market is in equilibrium, there is full employment, and real GDP equals potential GDP (Federal Reserve Bank of St. Louis n.d.). The year is captured using the IPUMS USA code YEAR which reports the four-digit year when the household was enumerated or included in the census.

https://usa.ipums.org/usa-action/variables/YEAR#description_section

$GroupYear_{it}$ is a vector of three categorized years that are used to create the time variable to interact with the regression in sections of mild recessionary period, severe recessionary, and expansionary period. The information provided by the Federal Reserve Bank (<https://fred.stlouisfed.org/series/JHDUSRGDPBR>) is used to determine which

years fall into either the mild or severe recessionary periods and which years fall into the expansionary years. If the majority of the year fell into a recessionary period then the year was included in the measures to estimate the changes in the recession. If the majority of the year fell into an expansionary period then the year was included in the expansionary grouping. The mild recession includes the year 2001. The severe recession is labeled for the years 2008 and 2009. Expansionary years is categorized to include all the other years; 2000, 2002 through 2006, and 2010 through 2016.

Region_{it} is a vector to capture the variation in income due to the location of the individual. The omitted category is west. The region was captured using the IPUMS USA code STATEICP which identifies the state in which the housing unit was located. The states were then categorized using the Census Bureau's definition of the nation's four main regions which is defined by the West, Midwest, South and Northeast.

https://usa.ipums.org/usa-action/variables/STATEICP#description_section

GroupYear_{it} x Female_{it} is a vector of a two-way interaction between the categorized year groups and female. The reference group for the estimate of λ_j is to men in the work force for the year 2010. The variation within the coefficients for the vector λ_j will provide insight on the impact of being female during the different periods of the economy.

GroupYear_{it} x EDUC_{it} is a vector of a two-way interaction between the categorized year groups and highest educational attainment. The reference group for the

estimate of δ_j is to the individuals who have no high school education in the work force in the year 2010. The variation within the coefficients for the vector δ_j will provide insight on the impact on income associated with different levels of educational attainment during the different periods of the economy.

GroupYear_{it} x MARST_{it} is a vector of a two-way interaction between the categorized year groups and marital status. The reference group for the estimate of θ_j is to the individuals who is widowed in the work force in the year 2010. The variation within the coefficients for the vector θ_j will provide insight on the impact of the difference in income due to marital status during the different periods of the economy.

GroupYear_{it} x RACE_{it} is a vector of a two-way interaction between the categorized year groups and racial categories. The reference group for the estimate of α_j is to the individuals who fall in the category of “other race” in the work force in the year 2010. The variation within the coefficients for the vector α_j will provide insight on the impact on income associated with the different race categories during the different periods of the economy.

Appendix B

Gender Raw Regression

Number of obs = 39173996
 F(1, 39173994) > 99999
 Prob > F = 0
 R-squared = 0.0393
 Root MSE = 1.233

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
female	-0.49852	0.000394	1265.11	0	-0.49929	-0.49774
_cons	10.17653	0.000282	3.60E+04	0	10.17598	10.17708

Gender No Labor Force Variables Regression

Number of obs = 39173996
 F(30,
 39173965) > 99999
 Prob > F = 0
 R-squared = 0.3181
 Root MSE = 1.0388

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
female	-0.47123	0.001426	-330.36	0	-0.47403	-0.46844
age	0.080808	0.000058	1393.54	0	0.080694	0.080922
age2	-0.00074	5.38E-07	1367.66	0	-0.00074	-0.00074
nchild	0.262671	0.000504	520.73	0	0.261682	0.26366
nchild2	-0.03656	0.00013	-280.51	0	-0.03681	-0.0363
famsize	-0.15383	0.000493	-311.85	0	-0.1548	-0.15286
famsize2	0.009282	5.62E-05	165.23	0	0.009172	0.009392
single	-0.32406	0.000561	-577.34	0	-0.32516	-0.32296
widowed	0.177566	0.000699	254.04	0	0.176196	0.178936
separated	-0.2105	0.00122	-172.55	0	-0.21289	-0.20811
divorced	-0.08982	0.000559	-160.8	0	-0.09092	-0.08873
black	-0.13308	0.0006	-221.76	0	-0.13426	-0.13191
asian	-0.09396	0.000952	-98.69	0	-0.09582	-0.09209
nativeamerican	-0.21456	0.001927	-111.32	0	-0.21833	-0.21078
mixed	-0.12945	0.001399	-92.56	0	-0.1322	-0.12671
otherrace	0.013839	0.000937	14.77	0	0.012002	0.015675
hsged	0.462202	0.000562	823.04	0	0.461102	0.463303
associates	0.677969	0.000584	1161.27	0	0.676825	0.679114
bachelors	1.125642	0.000659	1709.46	0	1.124351	1.126932
post	1.41489	0.000727	1945.24	0	1.413464	1.416315
northeast	0.0241	0.000541	44.56	0	0.02304	0.02516
midwest	-0.05117	0.00051	-100.28	0	-0.05217	-0.05017
south	-0.04859	0.000473	-102.76	0	-0.04952	-0.04767
mildrecess	0.172892	0.001735	99.65	0	0.169491	0.176292

severerecess	0.069613	0.0012	58.03	0	0.067262	0.071964
expan	0.07414	0.001021	72.59	0	0.072138	0.076142
mild_female	-0.13398	0.002589	-51.75	0	-0.13905	-0.1289
severe_female	-0.05179	0.001735	-29.85	0	-0.05519	-0.04839
expan_female	-0.06259	0.001471	-42.54	0	-0.06547	-0.0597
_cons	7.865862	0.002186	3599.1	0	7.861578	7.870145

Gender Labor Force Variables Regression

Number of obs = 39173996
 F(1, 39173994) > 99999
 Prob > F = 0
 R-squared = 0.5580
 Root MSE = 0.8362

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
female	-0.31555	0.001154	-273.57	0	-0.31781	-0.31329
age	0.032695	4.92E-05	665.11	0	0.032598	0.032791
age2	-0.00013	4.96E-07	-252.61	0	-0.00013	-0.00012
nchild	0.089721	0.000382	234.62	0	0.088971	0.09047
nchild2	-0.00889	9.67E-05	-91.99	0	-0.00908	-0.0087
famsize	-0.05853	0.000341	-171.78	0	-0.0592	-0.05786
famsize2	0.002538	3.75E-05	67.71	0	0.002464	0.002611
single	-0.15538	0.000434	-358.29	0	-0.15623	-0.15453
widowed	0.154024	0.000622	247.56	0	0.152804	0.155243
separated	-0.10585	0.000964	-109.79	0	-0.10774	-0.10396
divorced	-0.04544	0.000453	-100.32	0	-0.04633	-0.04455
black	-0.08157	0.000473	-172.41	0	-0.0825	-0.08065
asian	-0.10824	0.000753	-143.67	0	-0.10972	-0.10677
nativeamerican	-0.12131	0.001521	-79.77	0	-0.12429	-0.11833
mixed	-0.07202	0.001084	-66.44	0	-0.07415	-0.0699
otherrace	-0.08951	0.000714	-125.32	0	-0.09091	-0.08811
hsged	0.249513	0.000456	547.14	0	0.248619	0.250407
associates	0.424789	0.000476	892.05	0	0.423855	0.425722
bachelors	0.772556	0.000553	1396.15	0	0.771471	0.77364
post	1.047911	0.000639	1639.64	0	1.046659	1.049164
employed	0.017309	0.000727	23.82	0	0.015885	0.018733
unemployed	-0.15806	0.00108	-146.39	0	-0.16017	-0.15594
uhrswork	0.059335	5.16E-05	1148.84	0	0.059234	0.059436
uhrswork2	-0.00043	5.92E-07	-735.06	0	-0.00044	-0.00043
pastworkedyr	0.025721	0.001038	24.79	0	0.023688	0.027755
yesworkedyr	-1.83306	0.001551	1181.64	0	-1.83611	-1.83002

wkswork14_26	0.708125	0.001117	634.03	0	0.705936	0.710314
wkswork27_39	1.040547	0.001079	964.66	0	1.038433	1.042661
wkswork40_47	1.283984	0.00106	1211.14	0	1.281906	1.286062
wkswork48_49	1.442122	0.001179	1222.78	0	1.439811	1.444434
wkswork50_52	1.497007	0.000994	1506.85	0	1.495059	1.498954
selfclasswkr	-0.11069	0.000705	-157	0	-0.11207	-0.10931
wagesclasswkr	0.033623	0.000341	98.6	0	0.032955	0.034292
unpaidclasswkr	-0.4575	0.004422	-103.47	0	-0.46616	-0.44883
northeast	0.002186	0.000434	5.03	0	0.001335	0.003038
midwest	-0.08053	0.000412	-195.53	0	-0.08134	-0.07972
south	-0.08226	0.000382	-215.56	0	-0.08301	-0.08151
mildrecess	0.128588	0.00146	88.07	0	0.125727	0.13145
severerecess	0.061791	0.000992	62.32	0	0.059848	0.063735
expan	0.064042	0.000843	75.98	0	0.06239	0.065694
mild_female	-0.07362	0.002091	-35.21	0	-0.07772	-0.06952
severe_female	-0.03928	0.001399	-28.08	0	-0.04202	-0.03654
expan_female	-0.0349	0.001188	-29.38	0	-0.03723	-0.03257
_cons	7.788359	0.001774	4389.89	0	7.784882	7.791836

Education Raw Regression

Number of
obs = 39173996
F(5,
39173990) > 99999
Prob > F = 0
R-squared = 0.1535
Root MSE = 1.1573

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
hsged	0.663162	0.000653	1016.16	0	0.661883	0.664441
associates	0.847037	0.000669	1266.58	0	0.845726	0.848348
bachelors	1.389117	0.000727	1909.86	0	1.387691	1.390542
post	1.78325	0.000795	2242.88	0	1.781692	1.784808
_cons	9.072634	0.000572	1.60E+04	0	9.071513	9.073756

Education No Labor Force Variables Regression

Number of obs = 39173996
 F(42, 39173953) > 99999
 Prob > F = 0
 R-squared = 0.318
 Root MSE = 1.0388

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
female	-0.53059	0.000344	1543.21	0	-0.53127	-0.52992
age	0.080807	0.000058	1393.46	0	0.080694	0.080921
age2	-0.00074	5.38E-07	1367.48	0	-0.00074	-0.00074
nchild	0.262593	0.000504	520.56	0	0.261604	0.263582
nchild2	-0.03655	0.00013	-280.47	0	-0.03681	-0.0363
famsize	-0.15377	0.000493	-311.72	0	-0.15473	-0.1528
famsize2	0.009278	5.62E-05	165.17	0	0.009168	0.009388
single	-0.32386	0.000561	-576.96	0	-0.32496	-0.32276
widowed	0.17747	0.000699	253.9	0	0.1761	0.17884
separated	-0.21052	0.00122	-172.57	0	-0.21291	-0.20813
divorced	-0.08971	0.000559	-160.59	0	-0.0908	-0.08861
black	-0.13311	0.0006	-221.81	0	-0.13429	-0.13194
nativeamerican	-0.21448	0.001928	-111.28	0	-0.21826	-0.2107
asian	-0.09411	0.000952	-98.85	0	-0.09597	-0.09224
mixed	-0.12946	0.001399	-92.56	0	-0.1322	-0.12671
otherrace	0.013718	0.000937	14.64	0	0.011882	0.015555
hsged	0.456233	0.002673	170.66	0	0.450993	0.461473
associates	0.659605	0.002685	245.64	0	0.654342	0.664868
bachelors	1.151703	0.002905	396.44	0	1.146009	1.157397
post	1.457831	0.003131	465.66	0	1.451695	1.463967
northeast	0.02412	0.000541	44.6	0	0.02306	0.02518
midwest	-0.05115	0.00051	-100.23	0	-0.05215	-0.05015
south	-0.04857	0.000473	-102.7	0	-0.04949	-0.04764
mildrecess	0.066864	0.003831	17.45	0	0.059354	0.074373
severerecess	0.022804	0.002776	8.21	0	0.017364	0.028245

expan	0.049451	0.002408	20.54	0	0.044731	0.05417
mild_hsged	0.054645	0.004435	12.32	0	0.045952	0.063337
severe_hsged	0.019396	0.003173	6.11	0	0.013177	0.025616
expan_hsged	0.003375	0.002741	1.23	0.218	-0.002	0.008748
mild_associates	0.095543	0.004515	21.16	0	0.086693	0.104393
severe_associates	0.050275	0.003192	15.75	0	0.044018	0.056532
expan_associates	0.013654	0.002754	4.96	0	0.008256	0.019051
mild_bachelors	0.004315	0.005047	0.85	0.393	-0.00558	0.014207
severe_bachelors	8.77E-05	0.003487	0.03	0.98	-0.00675	0.006921
expan_bachelors	-0.03222	0.002985	-10.79	0	-0.03807	-0.02637
mild_post	-0.05356	0.005606	-9.55	0	-0.06455	-0.04257
severe_post	0.010089	0.003778	2.67	0.008	0.002684	0.017493
expan_post	-0.0535	0.003224	-16.6	0	-0.05982	-0.04718
_cons	7.892852	0.003026	2608.2	0	7.886921	7.898784

Education Labor Force Variables Regression

Number of obs = 39173996
 F(1,
 39173994) > 99999
 Prob > F = 0
 R-squared = 0.558
 Root MSE = 0.83625

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
female	-0.34978	0.000284	1230.01	0	-0.35034	-0.34922
age	0.032695	4.92E-05	665.1	0	0.032599	0.032792
age2	-0.00013	4.96E-07	-252.55	0	-0.00013	-0.00012
nchild	0.089686	0.000382	234.52	0	0.088936	0.090435
nchild2	-0.00889	9.67E-05	-91.98	0	-0.00908	-0.0087
famsize	-0.05849	0.000341	-171.66	0	-0.05916	-0.05782
famsize2	0.002536	3.75E-05	67.65	0	0.002462	0.002609
single	-0.15522	0.000434	-357.9	0	-0.15607	-0.15437
widowed	0.153984	0.000622	247.5	0	0.152765	0.155204
separated	-0.10584	0.000964	-109.78	0	-0.10773	-0.10395
divorced	-0.04535	0.000453	-100.13	0	-0.04624	-0.04446
black	-0.0816	0.000473	-172.47	0	-0.08253	-0.08067
nativeamerican	-0.12124	0.001521	-79.73	0	-0.12422	-0.11826
asian	-0.10833	0.000753	-143.8	0	-0.10981	-0.10686
mixed	-0.07205	0.001084	-66.47	0	-0.07418	-0.06993
otherrace	-0.08959	0.000714	-125.42	0	-0.09099	-0.08819
hsged	0.248957	0.002152	115.7	0	0.24474	0.253174
associates	0.42396	0.002154	196.87	0	0.419739	0.42818
bachelors	0.793042	0.002351	337.36	0	0.788435	0.79765
post	1.091861	0.002605	419.19	0	1.086756	1.096966
employed	0.017477	0.000727	24.05	0	0.016053	0.018902
unemployed	-0.15796	0.00108	-146.31	0	-0.16007	-0.15584
uhrswork	0.059328	5.16E-05	1148.71	0	0.059226	0.059429
uhrswork2	-0.00043	5.92E-07	-734.86	0	-0.00044	-0.00043
pastworkedyr	0.025894	0.001038	24.96	0	0.02386	0.027928

yesworkedyr	-1.83301	0.001551	1181.6	0	-1.83605	-1.82997
wkswork14_26	0.708045	0.001117	633.95	0	0.705856	0.710234
wkswork27_39	1.040593	0.001079	964.7	0	1.038479	1.042707
wkswork40_47	1.284069	0.00106	1211.21	0	1.281991	1.286146
wkswork48_49	1.44214	0.001179	1222.8	0	1.439828	1.444451
wkswork50_52	1.496953	0.000994	1506.75	0	1.495006	1.498901
selfclasswkr	-0.11065	0.000705	-156.94	0	-0.11203	-0.10927
wagesclasswkr	0.033544	0.000341	98.37	0	0.032876	0.034213
unpaidclasswkr	-0.45767	0.004421	-103.51	0	-0.46634	-0.44901
northeast	0.00219	0.000434	5.04	0	0.001339	0.003041
midwest	-0.08053	0.000412	-195.54	0	-0.08134	-0.07973
south	-0.08226	0.000382	-215.55	0	-0.083	-0.08151
mildrecess	0.087646	0.003095	28.32	0	0.08158	0.093713
severerecess	0.030702	0.002237	13.73	0	0.026318	0.035085
expan	0.058373	0.001941	30.08	0	0.054569	0.062177
mild_hsged	0.01662	0.003574	4.65	0	0.009614	0.023625
severe_hsged	0.015735	0.002554	6.16	0	0.01073	0.02074
expan_hsged	-0.00163	0.002207	-0.74	0.46	-0.00596	0.002696
mild_associates	0.024313	0.003627	6.7	0	0.017204	0.031423
severe_associates	0.024834	0.002557	9.71	0	0.019823	0.029846
expan_associates	-0.00259	0.002208	-1.17	0.241	-0.00692	0.001736
mild_bachelors	-0.00556	0.004077	-1.36	0.173	-0.01355	0.002433
severe_bachelors	0.000973	0.002814	0.35	0.73	-0.00454	0.006487
expan_bachelors	-0.02501	0.002412	-10.37	0	-0.02974	-0.02028
mild_post	-0.06282	0.004699	-13.37	0	-0.07203	-0.05361
severe_post	0.00077	0.003139	0.25	0.806	-0.00538	0.006922
expan_post	-0.05311	0.002677	-19.84	0	-0.05836	-0.04786
_cons	7.796719	0.00244	3194.81	0	7.791936	7.801503

Race Raw Regression

Number of
 obs = 39173996
 F(5,
 39173990) = 88771.27
 Prob > F = 0
 R-squared = 0.0108
 Root MSE = 1.2511

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
black	-0.34573	0.000675	-511.93	0	-0.34706	-0.34441
asian	0.034881	0.001104	31.61	0	0.032719	0.037044
nativeamerican	-0.45986	0.002178	-211.13	0	-0.46413	-0.45559
mixed	-0.35525	0.001668	-213.05	0	-0.35851	-0.35198
otherrace	-0.36596	0.001008	-363.24	0	-0.36793	-0.36398
_cons	9.979374	0.000223	4.50E+04	0	9.978937	9.97981

Race No Labor Force Variable Regression

Number of obs = 39173996
 F(42,
 39173953) > 99999
 Prob > F = 0
 R-squared = 0.3179
 Root MSE = 1.0389

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.]	Interval]
female	-0.53053	0.000344	1543.02	0	-0.5312	-0.52985
age	0.080808	0.000058	1393.42	0	0.080695	0.080922
age2	-0.00074	5.38E-07	1367.5	0	-0.00074	-0.00074
nchild	0.262632	0.000504	520.65	0	0.261643	0.26362
nchild2	-0.03655	0.00013	-280.5	0	-0.03681	-0.0363
famsize	-0.15378	0.000493	-311.78	0	-0.15475	-0.15281
famsize2	0.009278	5.62E-05	165.19	0	0.009168	0.009388
single	-0.50142	0.00083	-603.93	0	-0.50304	-0.49979
married	-0.17739	0.000699	-253.79	0	-0.17876	-0.17602
separated	-0.38805	0.001341	-289.45	0	-0.39067	-0.38542
divorced	-0.2672	0.000776	-344.41	0	-0.26872	-0.26568
black	-0.16261	0.002468	-65.89	0	-0.16745	-0.15778
nativeamerican	-0.22028	0.007745	-28.44	0	-0.23545	-0.2051
asian	-0.07632	0.003618	-21.09	0	-0.08341	-0.06923
mixed	-0.13449	0.005511	-24.4	0	-0.14529	-0.12369
otherrace	-0.01893	0.003957	-4.78	0	-0.02668	-0.01117
hsged	0.462227	0.000562	823.02	0	0.461126	0.463328
associates	0.678069	0.000584	1161.37	0	0.676925	0.679213
bachelors	1.125761	0.000659	1709.58	0	1.124471	1.127052
post	1.415075	0.000727	1945.46	0	1.413649	1.4165
northeast	0.024107	0.000541	44.57	0	0.023047	0.025167
midwest	-0.05117	0.00051	-100.26	0	-0.05217	-0.05017
south	-0.0486	0.000473	-102.76	0	-0.04952	-0.04767
mildrecess	0.096709	0.001421	68.06	0	0.093924	0.099494

severerecess	0.037758	0.000962	39.25	0	0.035872	0.039643
expan	0.039703	0.000819	48.51	0	0.038099	0.041307
mild_black	0.082198	0.004681	17.56	0	0.073024	0.091373
severe_black	0.043358	0.003015	14.38	0	0.03745	0.049267
expan_black	0.028609	0.002548	11.23	0	0.023615	0.033603
mild_asian	0.007219	0.007418	0.97	0.33	-0.00732	0.021757
severe_asian	0.002009	0.004526	0.44	0.657	-0.00686	0.010879
expan_asian	-0.02268	0.003761	-6.03	0	-0.03005	-0.01531
mild_mixed	0.041843	0.010969	3.81	0	0.020343	0.063342
severe_mixed	0.015872	0.006994	2.27	0.023	0.002165	0.029579
expan_mixed	0.003176	0.005722	0.55	0.579	-0.00804	0.014391
mild_nativeamerican	0.001281	0.01604	0.08	0.936	-0.03016	0.032718
severe_nativeamerican	0.035975	0.00976	3.69	0	0.016846	0.055104
expan_nativeamerican	0.002453	0.008028	0.31	0.76	-0.01328	0.018188
mild_other	0.021378	0.007757	2.76	0.006	0.006175	0.036581
severe_other	0.035784	0.004847	7.38	0	0.026285	0.045284
expan_other	0.034801	0.004071	8.55	0	0.026822	0.04278
_cons	8.076099	0.002024	3989.79	0	8.072132	8.080067

Race Labor Force Variables Regression

Number of obs = 39173996
 F(1, 39173994) > 99999
 Prob > F = 0
 R-squared = 0.558
 Root MSE = 0.83627

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
female	-0.34971	0.000284	1229.79	0	-0.35027	-0.34916
age	0.032697	4.92E-05	665.13	0	0.0326	0.032793
age2	-0.00013	4.96E-07	-252.6	0	-0.00013	-0.00012
nchild	0.089696	0.000382	234.56	0	0.088947	0.090446
nchild2	-0.00889	9.67E-05	-91.98	0	-0.00908	-0.0087
famsize	-0.05848	0.000341	-171.66	0	-0.05915	-0.05782
famsize2	0.002532	3.75E-05	67.57	0	0.002459	0.002606
single	-0.15531	0.000434	-358.1	0	-0.15616	-0.15446
widowed	0.153937	0.000622	247.42	0	0.152718	0.155157
separated	-0.10599	0.000964	-109.94	0	-0.10788	-0.1041
divorced	-0.04543	0.000453	-100.31	0	-0.04632	-0.04454
black	-0.1139	0.001957	-58.21	0	-0.11773	-0.11006
nativeamerican	-0.13748	0.006141	-22.39	0	-0.14952	-0.12545
asian	-0.09616	0.00286	-33.62	0	-0.10177	-0.09056
mixed	-0.07126	0.004238	-16.81	0	-0.07956	-0.06295
otherrace	-0.14701	0.003	-49.01	0	-0.15289	-0.14114
hsged	0.249541	0.000456	547.17	0	0.248647	0.250435
associates	0.424862	0.000476	892.16	0	0.423929	0.425796
bachelors	0.772616	0.000553	1396.22	0	0.771531	0.773701
post	1.047999	0.000639	1639.76	0	1.046746	1.049251
employed	0.017439	0.000727	24	0	0.016015	0.018863
unemployed	-0.15796	0.00108	-146.31	0	-0.16008	-0.15585
uhrswork	0.059332	5.16E-05	1148.78	0	0.059231	0.059433
uhrswork2	-0.00043	5.92E-07	-734.96	0	-0.00044	-0.00043
pastworkedyr	0.025667	0.001038	24.74	0	0.023633	0.027701
yesworkedyr	-1.83321	0.001551	1181.72	0	-1.83625	-1.83017

wkswork14_26	0.708123	0.001117	634.02	0	0.705934	0.710312
wkswork27_39	1.040526	0.001079	964.64	0	1.038412	1.04264
wkswork40_47	1.283968	0.00106	1211.11	0	1.28189	1.286046
wkswork48_49	1.442064	0.001179	1222.66	0	1.439753	1.444376
wkswork50_52	1.49708	0.000994	1506.92	0	1.495133	1.499027
selfclasswkr	-0.11058	0.000705	-156.83	0	-0.11196	-0.10919
wagesclasswkr	0.033654	0.000341	98.69	0	0.032986	0.034322
unpaidclasswkr	-0.4575	0.004421	-103.47	0	-0.46617	-0.44884
northeast	0.002199	0.000434	5.06	0	0.001347	0.00305
midwest	-0.08053	0.000412	-195.52	0	-0.08133	-0.07972
south	-0.08227	0.000382	-215.59	0	-0.08302	-0.08152
mildrecess	0.08316	0.001155	72	0	0.080896	0.085423
severerecess	0.038105	0.000782	48.74	0	0.036573	0.039638
expan	0.04166	0.000666	62.52	0	0.040354	0.042965
mild_black	0.058874	0.003669	16.05	0	0.051683	0.066065
severe_black	0.025616	0.00238	10.76	0	0.020952	0.03028
expan_black	0.034954	0.002019	17.31	0	0.030997	0.038911
mild_asian	0.021603	0.005924	3.65	0	0.009993	0.033213
severe_asian	-0.00896	0.003564	-2.51	0.012	-0.01594	-0.00197
expan_asian	-0.01451	0.002974	-4.88	0	-0.02033	-0.00868
mild_mixed	0.019972	0.008542	2.34	0.019	0.00323	0.036714
severe_mixed	0.009854	0.005373	1.83	0.067	-0.00068	0.020386
expan_mixed	-0.0027	0.004404	-0.61	0.54	-0.01133	0.005932
mild_nativeamerican	0.023801	0.012479	1.91	0.056	-0.00066	0.048259
severe_nativeamerican	0.027004	0.007742	3.49	0	0.011829	0.042178
expan_nativeamerican	0.015932	0.006363	2.5	0.012	0.003461	0.028403
mild_other	0.059828	0.005843	10.24	0	0.048376	0.07128
severe_other	0.044798	0.003663	12.23	0	0.03762	0.051977
expan_other	0.062785	0.003087	20.34	0	0.056734	0.068836
_cons	7.809824	0.001703	4584.96	0	7.806486	7.813163

Marital Status Raw Regression

Number of obs = 39173996
 F(4,
 39173991) > 99999
 Prob > F = 0
 R-squared = 0.0908
 Root MSE = 1.1995

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
single	-0.91522	0.000535	1711.25	0	-0.91627	-0.91417
widowed	-0.39932	0.000573	-696.53	0	-0.40045	-0.3982
separated	-0.43535	0.001308	-332.96	0	-0.43792	-0.43279
divorced	-0.1344	0.000558	-240.83	0	-0.13549	-0.1333
_cons	10.19689	0.000246	4.10E+04	0	10.19641	10.19738

Marital Status No Labor Force Variables Regression

Number of obs = 39173996
 F(39,
 39173956) > 99999
 Prob > F = 0
 R-squared = 0.318
 Root MSE = 1.0388

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
female	-0.53053	0.000344	1543.07	0	-0.53121	-0.52986
age	0.080834	0.000058	1393.73	0	0.08072	0.080947
age2	-0.00074	5.39E-07	1367.8	0	-0.00074	-0.00074
nchild	0.262877	0.000505	521.08	0	0.261888	0.263865
nchild2	-0.03659	0.00013	-280.71	0	-0.03684	-0.03633
famsize	-0.15401	0.000493	-312.11	0	-0.15497	-0.15304
famsize2	0.009297	5.62E-05	165.41	0	0.009186	0.009407
single	-0.37241	0.001862	-200.06	0	-0.37605	-0.36876
widowed	0.175134	0.002538	69	0	0.170159	0.180109
separated	-0.28368	0.005434	-52.2	0	-0.29433	-0.27303
divorced	-0.14477	0.002218	-65.28	0	-0.14912	-0.14042
black	-0.13306	0.0006	-221.73	0	-0.13424	-0.13188
nativeamerican	-0.21449	0.001928	-111.28	0	-0.21827	-0.21071
asian	-0.09406	0.000952	-98.79	0	-0.09592	-0.09219
mixed	-0.12923	0.001399	-92.4	0	-0.13197	-0.12649
otherrace	0.013949	0.000937	14.89	0	0.012113	0.015785
hsged	0.462249	0.000562	823.01	0	0.461148	0.46335
associates	0.678052	0.000584	1161.31	0	0.676907	0.679196
bachelors	1.125628	0.000659	1709.33	0	1.124338	1.126919
post	1.414807	0.000727	1945.04	0	1.413381	1.416232
northeast	0.024131	0.000541	44.62	0	0.023071	0.025191
midwest	-0.05118	0.00051	-100.29	0	-0.05218	-0.05018
south	-0.04856	0.000473	-102.69	0	-0.04949	-0.04763
mildrecess	0.051038	0.001681	30.36	0	0.047743	0.054333

severerecess	0.027763	0.001132	24.52	0	0.025544	0.029983
expan	0.021185	0.000967	21.91	0	0.01929	0.023079
mild_single	0.159358	0.003495	45.6	0	0.152509	0.166208
severe_single	0.031017	0.00227	13.67	0	0.026569	0.035466
expan_single	0.05154	0.001896	27.18	0	0.047823	0.055257
mild_widowed	-0.01777	0.004327	-4.11	0	-0.02625	-0.00929
severe_widowed	0.002382	0.002992	0.8	0.426	-0.00348	0.008247
expan_widowed	0.002923	0.002575	1.14	0.256	-0.00212	0.00797
mild_separated	0.181521	0.009447	19.21	0	0.163005	0.200037
severe_separated	0.067411	0.006519	10.34	0	0.054634	0.080188
expan_separated	0.075628	0.005588	13.53	0	0.064676	0.086581
mild_divorced	0.138513	0.003978	34.82	0	0.130716	0.14631
severe_divorced	0.051546	0.002688	19.18	0	0.046279	0.056814
expan_divorced	0.057088	0.002281	25.03	0	0.052618	0.061557
_cons	7.915687	0.002162	3661.22	0	7.911449	7.919924

Marital Status Labor Force Variables Regression

Number of
obs = 39173996
F(4,
39173991) > 99999
Prob > F = 0
R-squared = 0.558
Root MSE = 0.83625

lnincome	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
female	-0.34975	0.000284	1229.92	0	-0.3503	-0.34919
age	0.03271	4.92E-05	665.31	0	0.032613	0.032806
age2	-0.00013	4.96E-07	-252.9	0	-0.00013	-0.00012
nchild	0.089895	0.000382	235.08	0	0.089146	0.090645
nchild2	-0.00892	9.67E-05	-92.24	0	-0.00911	-0.00873
famsize	-0.05868	0.000341	-172.21	0	-0.05934	-0.05801
famsize2	0.002549	3.75E-05	68.01	0	0.002476	0.002623
single	-0.19873	0.001419	-140.08	0	-0.20151	-0.19595
widowed	0.145385	0.002288	63.55	0	0.140901	0.149868
separated	-0.17257	0.00434	-39.77	0	-0.18107	-0.16406
divorced	-0.07459	0.001847	-40.39	0	-0.07821	-0.07097
black	-0.08157	0.000473	-172.4	0	-0.08249	-0.08064
nativeamerican	-0.12125	0.001521	-79.73	0	-0.12423	-0.11827
asian	-0.10831	0.000753	-143.76	0	-0.10979	-0.10684
mixed	-0.07186	0.001084	-66.29	0	-0.07398	-0.06973
otherrace	-0.08945	0.000714	-125.22	0	-0.09085	-0.08805
hsged	0.249614	0.000456	547.29	0	0.248721	0.250508
associates	0.424888	0.000476	892.18	0	0.423955	0.425822
bachelors	0.772577	0.000553	1396.12	0	0.771492	0.773662
post	1.047858	0.000639	1639.54	0	1.046606	1.049111
employed	0.01725	0.000727	23.74	0	0.015826	0.018674
unemployed	-0.15815	0.00108	-146.49	0	-0.16027	-0.15604
uhrswork	0.059323	5.16E-05	1148.61	0	0.059222	0.059424
uhrswork2	-0.00043	5.92E-07	-734.83	0	-0.00044	-0.00043

pastworkedyr	0.025518	0.001038	24.59	0	0.023484	0.027552
yesworkedyr	-1.83302	0.001551	1181.62	0	-1.83606	-1.82998
wkswork14_26	0.708082	0.001117	634	0	0.705893	0.710271
wkswork27_39	1.040692	0.001079	964.84	0	1.038578	1.042806
wkswork40_47	1.284063	0.00106	1211.24	0	1.281985	1.28614
wkswork48_49	1.442249	0.001179	1222.92	0	1.439938	1.444561
wkswork50_52	1.497147	0.000993	1507.03	0	1.4952	1.499094
selfclasswkr	-0.11061	0.000705	-156.89	0	-0.112	-0.10923
wagesclasswkr	0.033617	0.000341	98.58	0	0.032949	0.034286
unpaidclasswkr	-0.45747	0.004421	-103.47	0	-0.46613	-0.4488
northeast	0.002201	0.000434	5.07	0	0.00135	0.003052
midwest	-0.08054	0.000412	-195.55	0	-0.08135	-0.07973
south	-0.08224	0.000382	-215.52	0	-0.08299	-0.0815
mildrecess	0.055427	0.001393	39.8	0	0.052697	0.058156
severerecess	0.030241	0.000945	32.01	0	0.028389	0.032093
expan	0.028837	0.000809	35.65	0	0.027251	0.030422
mild_single	0.10573	0.002654	39.84	0	0.100528	0.110931
severe_single	0.03112	0.001718	18.12	0	0.027753	0.034486
expan_single	0.046693	0.001441	32.4	0	0.043869	0.049518
mild_widowed	0.023343	0.003937	5.93	0	0.015627	0.031058
severe_widowed	-0.00542	0.002712	-2	0.045	-0.01074	-0.00011
expan_widowed	0.010646	0.002325	4.58	0	0.00609	0.015202
mild_separated	0.130522	0.007564	17.26	0	0.115698	0.145347
severe_separated	0.055751	0.005191	10.74	0	0.045577	0.065924
expan_separated	0.070654	0.004461	15.84	0	0.06191	0.079397
mild_divorced	0.062235	0.003308	18.81	0	0.055751	0.068719
severe_divorced	0.024505	0.002234	10.97	0	0.020127	0.028883
expan_divorced	0.030903	0.0019	16.26	0	0.027179	0.034628
_cons	7.821957	0.001761	4443.11	0	7.818507	7.825408

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