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# Impact of Unemployment Insurance Benefit Generosity on Re-employment Wages during the Great Recession

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**Abstract**

This paper examines the impact of the replacement ratio on re-employment wages during the great recession. This is done using a data set from IPUMS CPS displaced workers supplement between 2005 and 2012. Using OLS analysis, I estimated the impacts of the replacement ratio on the ratio of re-employment wages to pre-unemployment wages. I found that a replacement ratio of one would lead to a 77.6% increase in the ratio of re-employment wages to pre-unemployment wages, without the consideration of any other variables. The findings of the replacement ratio support economic theory and contradict the findings of some major papers on the subject, including the paper I based my model off. The analysis in this paper could be strengthened with weekly wage data as well as with the addition of more variables controlling for the impacts of a recession.

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**Introduction**

Many lives were uprooted by a recent event that demonstrates the importance of examining the effects of unemployment insurance, this event is the spread of COVID-19 and the recession caused by the worldwide shutdowns. This recession led to the largest number of jobless claims in the history of the US. According to the US Department of Labor, for the week of March 14th there were 251,416 initial jobless claims filed. This only got worse as during the week of March 21st there were 2,920,160 initial jobless claims filed and even worse during the week of March 28th there were 5,823,917 initial jobless claims. This is extremely concerning when the greatest jobless claims before this event was in the week of October 2nd in 1982 and was only 695,000 initial claims in a week which was greatly exceeded by the beginning of this recession. Higher jobless claims lead to more and more people becoming dependent on unemployment insurance and thus the more we can discover about the impacts of unemployment insurance the better we can understand the impacts on our country during tumultuous times such as those created by COVID-19.

Another relatively recent recession that shows the importance of unemployment insurance is the 2008 recession or the great recession. This was one of the worst recessions in American history and during this recession the US economy was tested. This was a period in time in which the US extended unemployment insurance benefits from the usual 26 weeks to 52 or more weeks up to a maximum of 99 weeks. Due to this extension, the Great Recession is another important period in time for unemployment insurance and further analysis of this time period should lead to a better understanding of the impacts of unemployment insurance.

With the changes in unemployment insurance that was caused by the Great Recession and the current COVID-19 epidemic the question I would like to examine is, what is the impact

of unemployment insurance generosity on re-employment wages? The data I will be using is the Current Population Survey Displaced Worker Supplement from IPUMS. This will also allow me to see what impact the great recession had on re-employment wages and the unemployment insurance system as a whole.

**Literature Review**

One of the first studies done on the topic of unemployment insurance is Ehrenberg and Oaxaca's "Unemployment Insurance, Duration of Unemployment, and Subsequent Wage Gain" from 1976. While this was not the first study done in this area, it was the first to consider the impact of unemployment on subsequent wage rates. They hypothesized that since unemployment insurance decreases the cost on unemployment it will increase the duration of unemployment and increase an individual's skill level which will increase post unemployment wages. Their findings using OLS estimators show that UI benefits impacted unemployment duration and post unemployment wages only for male workers who were laid off and then changed employers. They also found that when adjusting for tax rates the findings did not significantly change, which they hypothesized should would have an impact. When they repeated this with women, they confirmed many of the same results. However, when they look at a sample of young males only, they found that UI benefits did not have statistically significant impact on post unemployment wages.

Some of Ehrenberg and Oaxaca's findings were supported in Classen (1977). This is interesting as they used different OLS equations to estimate the re-employment wages. Ehrenberg and Oaxaca used the equation $\ln\left(\frac{W_{67}}{W_{66}}\right) = b_0 + b_1F + \sum_{i=2}^{k} b_i x_i$. In this equation $W_{67}$ is the individuals wage in 1967 and $W_{66}$ is the individuals wage in 1966. F is the replacement ratio and the summation represents the additional impactors. While Classen used the equation

$Y = \beta_0 + \beta_1 WBA + \sum \beta_i X_i + \mu_i$. Where Y is the reemployment wage and WBA is the weekly benefit amount and the summation represents the additional impactors. Classen found that unemployment benefit generosity had no statistically significant impact on re-employment wages which is consistent with the findings of Ehrenberg and Oaxaca for younger males and females but for their findings for older males and females, Ehrenberg and Oaxaca found unemployment insurance generosity had a statistically significant impact on re-employment wages.

In Kiefer and Neumann's "An Empirical Job-Search Model, with a Test of the Constant Reservation-Wage Hypothesis" from 1979. This paper showed that the post unemployment wage increased due to UI benefits, while Ehrenberg and Oaxaca did not find statistically significant evidence of this across different age groups. They pointed out that least squares' regressions are unable to effectively estimate re-employment wages. Their estimation was heavily based upon the estimation of an individual's reservation wage. This equation was $[1 - F(w_t^r)][h(w_t^r) - w_t^r = \theta w_t^r + \frac{\theta}{1-\theta} m$, where $(w_t^r)$ is the sequence of reservation wages, $F(w_t^r)$ is the distribution function of wage offers, θ is the discount factor, m is the direct costs of search, and $(h(w_t^r)$ is $\int_{w_t^r}^{\infty} w^0 f(w^0) dw^0 / [1 - F(w_t^r)]$ which is the conditional mean of $w^0$, which is wage offers, given that $w^0 > w^r$. This estimates the chance that an individual accepts a job offer dependent on the wage they found that re-employment wages were increased by larger unemployment benefits when assuming constant reservation wages.

Another study looking at re-employment wages is McCall and Chi (2008). This differs from many of the previous studies as they looked at just the amount of unemployment insurance as compared to replacement ratio as many other papers do. Using this approach, they found that an increase in $100 in weekly benefits lead to a 7% increase in re-employment wages. This once again contradicts the finding of Ehrenberg and Oaxaca (1976) and Classen (1977) that there is

not a statistically significant impact while supporting Kiefer and Neumann (1979) findings. As you can see there is a large amount of disagreement in the findings of the research for this topic and as such is an interesting area to look at as we are not entirely sure which paper has the correct findings.

A more recent study not focused on re-employment wages is Card et al (2015). This looks at UI benefits in Missouri and the impact of the 2008 recession on the impacts of UI. They did this with a regression kink model. They found claims to be much longer post-recession than pre-recession. This was one of the only studies I was able to find about the great recession and the impacts it had on unemployment insurance. I also couldn't find any studies looking at the impact of the great recession on re-employment wages and thus is why I decided to look at how unemployment insurance during the great recession impacted re-employment wages.

**Theoretical Model**

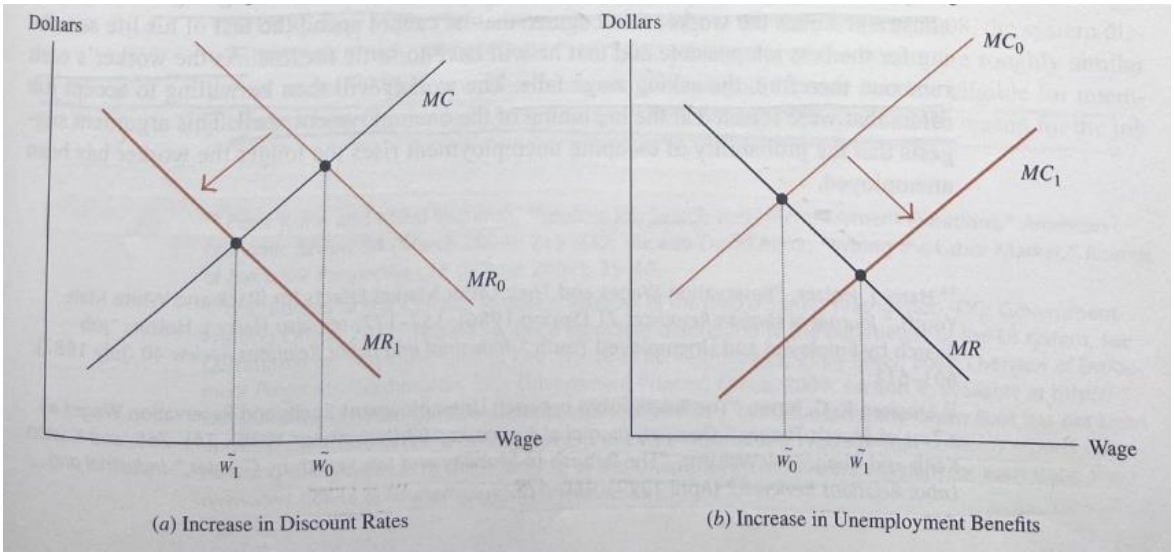
The theoretical model I will be utilizing is search theory. Search theory says that someone will continue to search if the benefit of the additional search is greater than the cost. In terms of unemployment the benefit of the additional search is the potential increase in re-employment wage that an individual could receive, and cost is the cost of being unemployed. The cost of being unemployed, while receiving unemployment insurance, is often viewed as the replacement ratio which is income while unemployed divided by income at lost job. This ratio gives you an idea of how much quality of life someone losses while unemployed.

According to this theory the longer you search for something, the greater the value of what you search for will be. This means that the longer your spell of unemployment the larger your re-employment wage should be. It is also important that in this model we assume a sequential search in which a person receives individual job offers and either accepts or denies at

the time the job is offered. This is in contrast to a non-sequential search in which an individual interview at a set amount of businesses and accepts the largest wage offered.

During unemployment, each individual has an asking wage or reservation wage. This is the wage that will bring someone out of unemployment. This declines over time the longer someone is unemployed as their desire for a job increases as the cost of being unemployed is high. In theory, someone will take a job if it matches their asking wage and so the longer you are unemployed the higher the chance of receiving a job that matches your asking wage increases as your asking wage decreases over time.

Unemployment insurance comes into this equation as it impacts the cost of being unemployed. It reduces the cost of being unemployed as it increases your income while unemployed. This allows someone to remain unemployed for longer and will increase the duration of their search. This is because the cost of being unemployed is lower so someone will search for longer as the benefits from the search will outweigh the costs for longer.




The impact of unemployment insurance is demonstrated in the rightward shift of the marginal cost curve. This reflects the decrease in the marginal cost brought on by the existence

of unemployment insurance and demonstrates the increase in wages brought on by the decrease in the cost of unemployment.

**Econometric Model**

My econometric model will be looking at the impact of unemployment insurance weekly benefits during the Great Recession of 2008. I will be doing this by examining the impact of the replacement rate, which is the percentage of the previous wage that someone is receiving in unemployment insurance, on the re-employment wage compared to the wage of the lost job. I will be doing this by slightly modifying a model gotten from "The effects of unemployment insurance on post unemployment earnings" by John Addison and McKinley Blackburn.

The model that they used was $\log\left(\frac{W_s}{W_p}\right) = \gamma_1 R + \gamma_2 X + u$. Where $W_s$ is the weekly earnings at the time of the survey, or post-unemployment wage, $W_p$ is the weekly earnings for the lost job, R is the replacement ratio, and X is a matrix of all of the rest of the variables. Theoretically the previous wages could be influencing the coefficient for the replacement rate as there is a nonlinear relationship between previous wages and the replacement rate as the replacement rate uses previous wages in its calculation but Addison and Blackburn found that adding previous wages had no important changes to any parts of the model so it doesn't need to be included.

The slightly modified model I will be using is:

$$lnearning = \beta_0 + \beta_1 replacementratio + \beta_2 ageBY + \beta_3 female + \beta_4 black + \beta_5 tenure + \beta_6 tenure^2 + \beta_7 unemppct + \beta_8 positgone + \beta_9 weeksunemployed + \varepsilon .$$

In this model:

*lnearning* is the natural log of the reemployment weekly earnings divided by the natural log of the weekly earnings at the previous job, this is the dependent variable in the model.

*replacementratio* is the replacement ratio, which is the unemployment insurance benefit amount, calculated by state by year using their previous wage, divided by the previous weekly wage. This should have a positive impact on the dependent variable as I explained previously in my theoretical model higher unemployment insurance payouts decrease the cost of unemployment which should increase the duration of unemployment, which should increase the re-employment wage.

*ageBY* is the individuals age when they lost their job. This should have a positive impact as people who are older make more money than people who are younger on average.

*female* is a dummy variable where the variable equals one if the individual is a woman and zero if not, this should have a negative impact on the dependent variable as women make less money than men on average.

*black* is a dummy variable where the variable equals one if the individual is black and a zero if not, this should have a negative impact on the dependent variable as black people make less than white on average.

*Tenure* is the amount of time worked at the previous job in years, this should have a negative impact on the dependent variable as tenure decreases re-employment wages. $Tenure^2$ is included in the model as impact of tenure changes the higher the value is, and this should have a negative impact.

*unemppct* is the unemployment percentage during the base year of unemployment, this should have a negative impact on the dependent variable as the higher the rate of unemployment the more people available for a job offering.

*Positgone* is a dummy variable for why an individual lost their job, it takes on a value of one if their position was gone and 0 if they lost their job for any other reason. This should have a negative impact on re-employment wages.

*Weeksunemployed* is the number of weeks that an individual spent unemployed before finding a new job. This should have a positive impact as the longer someone is unemployed, the longer they have to search for a better wage.

**Data**

I obtained data from the Current Population Survey Displaced Workers Supplement from IPUMS. The Current Population Survey is a monthly survey of American households conducted by both the US Census Bureau and the Bureau of Labor Statistics. According to their website, this survey was created during the great depression to monitor the level of unemployment in the US. This survey is administered to over 65,000 households each month. Specifically, the Displaced Worker Supplement, what my data comes from, is collected every other year and has information on earnings and unemployment from responders who had lost a job within the past few years. This only surveys people over 20 and who lost a job within the past 3 years and were not recalled to their work within 6 months after losing their job.

My data set contains data from 1984-2018 collected every two years. This data set contains 2,462,547 observations. Once I had obtained the data and formatted it using IPUMS provided code, I began to set no response and NIU responses to missing values for variables of interest. An example of this is NIU responses for education, I couldn't think of a reason why someone over 20 would be excluded from education. Another example is NIU responses for wage for the current job, if an individual was NIU for current wage and were unemployed then they wouldn't have been reemployed, and therefore aren't able to be used to show impacts on re-

employment wages if they don't have re-employment wages. I also eliminated all individuals who didn't receive unemployment insurance as I'm looking at the effect of the replacement ratio and individuals who didn't receive unemployment insurance will skew my data as that will have so many people with a replacement ratio of 0. In doing this I restricted my data from 2,463,547 observations to 42,725 observations.

The main part of my work with data was creating dummy variables to be used in my model as well as creating the replacement ratio variable. I created dummy variables for sex, race, high school graduates, reason for job loss, and exhaustion of unemployment insurance. The main variable of interest, replacement ratio, needed to be created as well. To do this I had to calculate weekly unemployment insurance benefits by year by state. This was the point that I decided to restrict the years I was looking at to 2005 through 2012 instead of the full range of my original data. This restricted my data to 8,439 observations. After I had found the weekly benefits for those years, all I had to do was divide weekly benefits by the weekly wage at the lost job for each individual to get the replacement ratio. After doing this I had set everything up with my data and was prepared to begin running models.

My data set contains the following variables: Survey year, State, Age, Sex, Race, Marital status, Employment status, Labor force status, Years of college credit completed, High school or GED, Highest grade completed before receiving GED, Reason lost of left job, Years ago last worked at lost job, Length of time worked at lost job in years, Weekly earnings at lost job, Hourly wage at lost job, Received unemployment benefits, Exhausted unemployment benefits, Industry for lost job, Occupation for lost job, Weekly earnings at current job, Hourly wage at current job, and Number of weeks not working between end of lost job and start of next job. Many of these variables will be vital in my analysis of my research question.

**Results**

The most important part of the examination of this model is the impacts of the variables, specifically the main variable of interest, *replacementratio*. My model found that if an individual had a replacement ratio of one, meaning they got their full previous wage in unemployment insurance, that their reemployment wage would be increased by 77.6% per week compared to their lost job's weekly wage. This means that at the mean value of *replacementratio,* which is .4597, that re-employment wage would be increased by 35.67% compared the wage at the lost job, but this doesn't take into question any other variables that decrease re-employment wage to an overall decrease in wages on average. This is a big impact and since is statistically significant at the 99% level and contradicts what similar papers have found. This impact shows that it is worth examining the impact of unemployment insurance payouts on re-employment wages which hasn't been thought to be the case.

Looking at the rest of my model, *replacementratio,* while being the most significant variable in terms of analysis is not the most impactful. *Tenure* has a larger overall impact and *ageBY* has close to the same impact as *replacementratio.* Since, both of these have negative impacts it's easy to see how people, even when they receive unemployment insurance still have a lower wage, on average, at their new job then they used to have. In addition, each variable besides *replacementratio* and $tenure^2$ has a negative impact on re-employment wages and this again represents how the mean of *lnearning* is negative.

Now with the error analysis, the adjusted $R^2$ is just .0357. Which means that the model explains just 3.57% of the variation in the dependent variable. This is a very low as the study I based my model on, Addison and Blackburn (2000), had a $R^2$ value of .275 with a similar sample size of a little over 3,000 observations. Although, because my dependent variable is the

log of a ratio which naturally has a low $R^2$ value as it being a ratio decreases the range of the dependent variable and then taking the log of that reduces the range even further. Also, this value is, while still something that needs to be looked at, is not as impactful to the findings as the parameter estimate for *replacementratio*.

**Implications**

With the current COVID-19 recession going on, it's important to look at what the findings in this paper could show about the resolution of this crisis. With this I am assuming that the impacts from the Great Recession will be comparable to the COVID-19 recession and since the Great Recession is the most current large recession I believe this assumption is justified. As you can see with just the averages of each variable, re-employment wages should overall decrease compared to an individual's wages before losing their job but, according to my model the best way to counteract this is the amount of weekly unemployment benefits.

The US federal government's response to COVID-19 was the CARES act. This was a $2.2 trillion spending package designed to help the US economy in the current recession. This had some large effects on unemployment insurance. The CARES act extended unemployment insurance from the regular 26 weeks to a maximum of 39 weeks, making the COVID-19 recession even more comparable to the Great Recession. The CARES act also adds an extra $600 in weekly benefits from April 5$^{th}$, 2020 to July 31$^{st}$, 2020 which will be received by anyone for any week.

With these changes we should see a better return to normality. With the increase in unemployment insurance individuals should see increasing re-employment wages, which will help our economy return to where it was before. This is because if someone's re-employment wage is lower than the wage they lost, they will have less to spend and so the economy will

continue to struggle if the entire unemployed population sees a lower re-employment wage, but the increase to unemployment insurance will help to increase re-employment wages and therefore increase spending when people eventually find a new job as well as increasing spending during the interim.

**Conclusion**

The replacement ratio, the main variable of significance, had a large impact on re-employment wages and was significant at the 99% confidence level, and this is in conflict with what some people have found as it was common for it to not be statistically significant and in many papers it had nowhere near the impact it had in my analysis. Although several of the other variables didn't have the impacts that they theoretically should have had could indicate a mistake in the examination of my research question that could explain why my findings are different from many other findings.

This data shows us that examining the impact of unemployment insurance payouts is actually important as it does have an impact on the re-employment wage as many other papers have not found. This is something I find interesting as I had vastly different results from someone using a very similar model to me, but our data was separated by 20 years and perhaps in that time people and the way unemployment works could have changed enough to have this different of results.

Throughout the analysis of my findings, I have noticed a couple possible sources of error. One of the main ones was that I was calculating each individual's unemployment insurance benefits myself. This is an issue because I only had data on their weekly wage when they lost their job and as unemployment insurance depends on quarterly wages to determine payouts there is a good chance that not everyone was making the same wage every week, but I had to make the

assumption that they were. Also, I didn't have data on how many dependents each individual had and as such there could have been changes to their unemployment insurance payouts that I couldn't show in my calculations.

Additionally, I was unable to control more for the impacts of the recession, specifically the extension of unemployment insurance. I believe this could be a reason why several of my variables had an unanticipated impact in the model. It could also impact the other variables due to omitted variable bias and raise the low adjusted $r^2$ value. If I was able to more greatly control for the impacts of this recession, there could have been a much bigger and more important impact for the rest of the model that could have led to more important findings that could impact our unemployment insurance policies during the outbreak of COVID-19. This is because the main point of this paper is to show us what impacts our options have during a recession and thus, this analysis should be very helpful during the recession we currently find ourselves in.

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## Appendix

**Data Statistics**
**Exhausted Unemployment Insurance**

The MEANS Procedure

| Variable | Label | N | Mean | Minimum | Maximum |
|---|---|---|---|---|---|
| lnearning | | 1079 | -0.5331918 | -11.0116706 | 1.9642959 |
| replacementratio | | 2287 | 0.4661323 | 0 | 1.0000000 |
| ageby | | 2851 | 43.7516661 | 17.0000000 | 83.0000000 |
| DWWEEKC | Weekly earnings at current job | 1312 | 566.4404649 | 0.0200000 | 2792.00 |
| DWWEEKL | Weekly earnings at lost job | 2294 | 756.9317873 | 0 | 2800.00 |
| female | | 2851 | 0.4419502 | 0 | 1.0000000 |
| black | | 2851 | 0.1487197 | 0 | 1.0000000 |
| DWYEARS | Length of time worked at lost job in years | 2732 | 5.9715044 | 0.0100000 | 39.0000000 |
| unemppct | | 2851 | 7.6810944 | 4.4000000 | 9.9000000 |
| positgone | | 2851 | 0.2637671 | 0 | 1.0000000 |
| DWWKSUN | Number of weeks not working between between end of lost or left job and start of next job | 1480 | 36.0236486 | 0 | 156.0000000 |

**Data Statistics**
**Did Not Exhaust Unemployment Insurance**

The MEANS Procedure

| Variable | Label | N | Mean | Minimum | Maximum |
|---|---|---|---|---|---|
| lnearning | | 2288 | -0.2844312 | -11.2891817 | 2.5820816 |
| replacementratio | | 4412 | 0.4563325 | 0 | 1.0000000 |
| ageby | | 5588 | 41.8178239 | 17.0000000 | 78.0000000 |
| DWWEEKC | Weekly earnings at current job | 2843 | 742.9849842 | 0 | 2884.00 |
| DWWEEKL | Weekly earnings at lost job | 4420 | 830.3015385 | 0 | 2884.00 |
| female | | 5588 | 0.4022906 | 0 | 1.0000000 |
| black | | 5588 | 0.0884037 | 0 | 1.0000000 |
| DWYEARS | Length of time worked at lost job in years | 5418 | 5.8233407 | 0 | 53.0000000 |
| unemppct | | 5588 | 8.0137258 | 4.4000000 | 9.9000000 |
| positgone | | 5588 | 0.2641374 | 0 | 1.0000000 |
| DWWKSUN | Number of weeks not working between between end of lost or left job and start of next job | 3055 | 18.2599018 | 0 | 134.0000000 |

**Data Statistics**
**Total Data Used in Model**

The MEANS Procedure

| Variable | Label | N | Mean | Minimum | Maximum |
|---|---|---|---|---|---|
| lnearning | | 3367 | -0.3641498 | -11.2891817 | 2.5820816 |
| replacementratio | | 6699 | 0.4596781 | 0 | 1.0000000 |
| ageby | | 8439 | 42.4711459 | 17.0000000 | 83.0000000 |
| DWWEEKC | Weekly earnings at current job | 4155 | 687.2385560 | 0 | 2884.00 |
| DWWEEKL | Weekly earnings at lost job | 6714 | 805.2329937 | 0 | 2884.00 |
| female | | 8439 | 0.4156891 | 0 | 1.0000000 |
| black | | 8439 | 0.1087807 | 0 | 1.0000000 |
| DWYEARS | Length of time worked at lost job in years | 8150 | 5.8730074 | 0 | 53.0000000 |
| unemppct | | 8439 | 7.9013509 | 4.4000000 | 9.9000000 |
| positgone | | 8439 | 0.2640123 | 0 | 1.0000000 |
| DWWKSUN | Number of weeks not working between between end of lost or left job and start of next job | 4535 | 24.0571114 | 0 | 156.0000000 |

*All data comes from IPUMS CPS Displaced Worker Supplement

| | |
|---|---|
| Number of Observations Read | 8439 |
| Number of Observations Used | 3238 |
| Number of Observations with Missing Values | 5201 |

| Analysis of Variance | | | | | |
|---|---|---|---|---|---|
| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
| Model | 9 | 129.70204 | 14.41134 | 14.31 | <.0001 |
| Error | 3228 | 3250.58115 | 1.00700 | | |
| Corrected Total | 3237 | 3380.28319 | | | |

| | | | |
|---|---|---|---|
| Root MSE | 1.00349 | R-Square | 0.0384 |
| Dependent Mean | -0.34594 | Adj R-Sq | 0.0357 |
| Coeff Var | -290.07739 | | |

| Parameter Estimates | | | | | | |
|---|---|---|---|---|---|---|
| Variable | Label | DF | Parameter Estimate | Standard Error | t Value | Pr > \|t\| |
| Intercept | Intercept | 1 | -0.08063 | 0.11741 | -0.69 | 0.4923 |
| replacementratio | | 1 | 0.77590 | 0.13461 | 5.76 | <.0001 |
| ageby | | 1 | -0.00861 | 0.00166 | -5.19 | <.0001 |
| female | | 1 | -0.04231 | 0.03656 | -1.16 | 0.2472 |
| black | | 1 | -0.08440 | 0.06084 | -1.39 | 0.1655 |
| DWYEARS | Length of time worked at lost job in years | 1 | -0.02012 | 0.00767 | -2.62 | 0.0087 |
| DWyears2 | | 1 | 0.00049920 | 0.00029662 | 1.68 | 0.0925 |
| unemppct | | 1 | -0.01098 | 0.00873 | -1.26 | 0.2084 |
| positgone | | 1 | -0.05462 | 0.03923 | -1.39 | 0.1640 |
| DWWKSUN | Number of weeks not working between between end of lost or left job and start of next job | 1 | -0.00268 | 0.00074050 | -3.62 | 0.0003 |