The UAW's Impact on Wages in the US Auto Industry

Much economic debate has occurred over the effect that unions have on the wages, profits, and employment of the industry they represent. This paper focuses on the United Automobile Workers (UAW) labor union and determines if the union's declining influence between 1960 and 2000 significantly reduced the wages of US autoworkers. The paper utilizes time-series data that reviews correlation between the variables, includes a regression that analyzes the relationship between autoworker wages and UAW union density, controls for other factors that affect autoworker wages, and controls for possible structural shifts in the industry. The results indicate that there is a statistically significant, positive relationship between union density and wages, and also exemplify the significance of other variables that affect wages, such as the market share of the Big Three auto companies and the public approval of unions.

Alec Zucker
Dr. Michele Naples
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The Rise and Fall of the UAW

Since its inception in 1935, the United Automobile Workers (UAW) labor union has had a significant impact on the American automobile industry. The higher wages, pensions, and generous benefit packages that so many autoworkers enjoy today may have never have been possible without the efforts of the UAW. The US auto industry, which has been primarily dominated by Ford, General Motors, and Chrysler (also known as the Big Three), became a shining example of economic prosperity after World War II; consequently, the UAW's involvement and influence had significant implications for thousands of workers across the US. Like many other public and private sector unions, the UAW's power eroded between 1960 and the early 1990s. While some attribute the union's decline to increased competition from foreign autoworkers, others point to policy changes and the worsening public perception of unions that have constrained the UAW's ability to advocate in favor of US autoworkers.

The purpose of this paper is to determine whether or not there is a statistically significant relationship between union density and wages for US autoworkers, and thus the paper will work to answer this question: *has the UAW's level of union density, which declined throughout the forty-year period between 1960 and 2000, significantly impacted the wages of the unionized autoworkers it represented?* Before analyzing data, my hypothetical answer to this question is yes. An influential UAW has additional leverage in the collective bargaining process that decides the wages of the autoworkers, whereas management will take advantage of a weaker union and provide lower wages with less generous benefit packages to maximize profits. The analysis will be conducted relative to the changing economic and political conditions between 1960 and 2000, while also controlling for other variables, like the profit rate of the industry and the market share of the Big Three auto producers, which all simultaneously affect the American auto industry.

In order to determine if the UAW's union density raises the wages of its members, I conduct a quantitative study, using time-series data over a forty-year period between 1960 and 2000, which will utilize multivariate regressions containing several independent variables that may impact autoworker wages, the dependent variable. I review the correlation between the variables, a regression that analyzes the relationship (or lack thereof) between union density and wages while controlling for other factors that affect autoworker wages, and finally a regression controlling for structural shifts in the industry. The results of my study indicate that there is a statistically significant, positive relationship between union density and wages, and also exemplify the significance of other variables that affect wages, such as the market share of the Big Three auto companies as well as the overall public approval of unions.

A Cost-Benefit Analysis of Unions and the UAW

Much economic literature has been written regarding the impact unions have had on the wages for unionized employees. Bryson 2007 provides a comprehensive overview of the effect unions have on wages, and he notes that a union's bargaining strength determines whether or not the union is successful in augmenting the wages of its members. He argues that a union's bargaining leverage is enhanced if more workers within an industry are enrolled relative to the total number of workers in the industry (see Bryson 2007, p. 33-34). Freeman and Medoff 1984 concur with Bryson and show that unions have consistently augmented the wages of the employees they represent, particularly amongst the less educated. The authors show that the union-wage effect is more substantial for unskilled workers, like most autoworkers who have attained solely a high-school diploma or some college, than for highly-skilled workers, which implies that the UAW should have increased the wages for workers in the auto industry (see Freeman and Medoff 1984, p. 11-17). Card 1996 concurs with Freeman and Medoff in that the

wage effect is stronger for unskilled labor than skilled labor, and also adds that underlying wage differences due to age, education, and region are typically smaller for unionized workers (see Card 1996, p. 976). This wage effect typically fosters the least amount of disagreement, as most economists also agree that firms with a unionized workforce tend to have lower profit rates than firms with non-unionized labor. Addison and Hirsch 1989 claim that lower profitability amongst unionized firms is "well-established" and is primarily caused by the higher wages and benefit packages that unions garner for their constituencies. The authors also note that unions in competitive markets are less likely to obtain large wage premiums and are more effective in specialized industries (see Addison and Hirsch 1989, p. 72-89, 100-101). My study will confirm that this union-wage effect has occurred in the US auto industry throughout the UAW's existence and will review other factors that affect the wages of unionized employees, like the profit rate and economic conditions.

DeFina 1983 delves deeper into how this wage premium that unions generate results, and his paper also reviews the implications for the allocation of resources and efficiency that occur as a result of the higher wages unions earn for their members. He notes that changes in the prices and quantities of commodities and factors of production that vary across industries lead to a wage premium in unionized sectors, though these adjustments often carry a deadweight loss. While some argue that the wage differential between unionized and non-unionized sectors diminishes efficiency in the unionized industries, DeFina disagrees, arguing that the union-wage differential decreases economic efficiency only minimally. In response to his critics, DeFina experimented with his data and removed the wage differential between unionized and non-unionized sectors. He found that the efficiency gain from eliminating the differential never exceeded 0.2% of GNP in every scenario (see Defina 1983, p. 408, 427-428). These findings

discredit the notion that the higher wages earned by unions like the UAW reduce efficiency in their respective sectors. Borjas 1979 adds to Defina's analysis of the union-wage effect, noting that the effect on the reservation wage, the lowest wage at which a prospective employee will accept a particular job, is weaker than its effect on the actual wage. He also shows that the union-wage effect is larger in the early years of job tenure and gradually declines after this point as the worker ages (see Borjas 1979 p. 38-39).

Bryson 2007 also explains how the wage effect generated by unions creates a wage differential between unionized and non-unionized sectors, primarily for three reasons. First, unique to unionized sectors, unions fight against pressure to reduce wages in times of recession. Second, unions garner a higher wage premium in their sector that limits labor entry into the unionized sector, since firms can only spend so much on labor (the Wage-Fund Doctrine), which increases labor supply and competition in the non-unionized sector. This increased competition for fewer jobs in non-unionized sectors lowers the wages in these industries. And third, which compresses wage inequality between unionized and non-unionized sectors but not enough to diminish the difference, employers in non-unionized sectors often feel threatened that their workers may unionize, so they raise wages to prevent them from having a reason to organize (see Bryson 2007, p. 34). Bryson also shows that the wage premium generated by unions occurs throughout the world, including a 17% increase in wages for unionized sectors (compared to non-unionized industries) in the US between 1993 and 2002. He also claims that, despite the fact that union density has declined in countries like the US and the UK, there is minimal evidence of a declining wage premium that unions earn, as non-unionized workers still make significantly less than unionized workers in related industries (see Bryson 2007, p. 38-41).

In addition to the benefits that unions achieve for their members, some economists have argued that union activities also improve the fortunes for workers in other industries that may be unrelated to unionized industries. Budd 1992 shows that unions like the UAW have often used pattern-bargaining during contract negotiations, which is a principle ensuring that when a contract is agreed upon, that contract may serve as a pattern (or model) for contracts with other firms. He discovered a significant amount of pattern-following in industries with few economic ties to the auto industry, such as in agriculture and aerospace, as well as in other manufacturing industries. Furthermore, Budd found that the importance of pattern-bargaining declined after 1980, in conjunction with waning UAW influence (see Budd 1992, p. 524, 536-538). Freeman and Medoff 1984 agree with this assessment, claiming that non-union workers often enjoy higher wages as a result of pattern-bargaining by organized workers (see Freeman and Medoff 1984, p. 12-14). For these reasons, an analysis to determine if the unionized auto industry's impact on wages also affects the overall manufacturing industry may validate these claims.

Freeman and Medoff 1984 also draw many conclusions regarding the effect of unions on wage inequality and employment in the labor market. They discredit the claim that unions significantly increase wage inequality between unionized and non-unionized sectors, arguing that the reduction the in initial wage-inequality between skilled and unskilled labor (due to differences in skill) overrides this outcome and leads to a net-reduction in wage inequality. Since skilled labor is less likely to unionize, the unions who typically represent unskilled labor reduce wage inequality among the varying skill levels, which outweighs the inequality between unionized and non-unionized sectors (see Freeman and Medoff 1984, p. 11-12). Card 1996 also showed that unions tend to reduce wage inequality due to differences in age, education, and

region in their particular industry, so this is more evidence that unions do not augment inequality between workers (see Card 1996, p. 976).

In terms of employment, Freeman and Medoff state that unionized workers enjoy better job security than non-unionized workers. However, they explain that during an economic downturn, unionized firms are more likely to make temporary layoffs and fewer cuts in wages than non-unionized firms (see Freeman and Medoff 1984, p. 10-14). Therefore, even though unions may have a positive effect on wages by maintaining pre-recession levels, they may decrease employment for individuals seeking work in a particular industry. Despite having better job security according to Freeman and Medoff, as well as higher wages, Borjas 1979 found that union members typically have lower levels of job satisfaction, though this satisfaction is highly dependent on tenure. In turn, unions may garner additional benefits, such as higher wages and more generous benefit packages, for their more senior members as a result of this finding (see Borjas 1979, p. 38-39).

While the UAW was a powerful voice for US autoworkers, economists have presented several theories as to why the union's influence declined in the 1980s and 1990s. Bluestone 2011 notes that the UAW fought for rules that undermined efficiency, felt their privileged status would last forever in a changing automotive market, and fell victim to mistakes by management that reduced their competitiveness in the face of foreign competition. He also claims that the UAW failed to encourage auto companies to produce innovative vehicles of high quality to compete with foreign imports (see Bluestone 2011, slides 6-14). Contrary to Bluestone's arguments, Lichtenstein 1985 attributes much of the blame to pattern-bargaining, stating that the technique reduced the efficiency and competitiveness of the auto-industry firms, which hindered the efforts of labor (see Lichtenstein 1985, p. 360-366). Despite the disagreement over the causes of the

union's decline, economists concur that the UAW's advocacy power was reduced and likely affected the wages of autoworkers.

Data and Methodology

In order to formulate a conclusion as to whether or not union density augments the wages of unionized workers in the US auto industry, I will conduct a quantitative study that analyzes several multivariate regressions with control variables. This study will utilize time-series data and will attempt to identify a relationship between union density and wages over a forty-year period, including 40 yearly observations between 1960 and 2000, while also controlling for structural shifts between the two decades prior to and following 1980. The dependent variable for the multivariate regression will be the wages of all autoworkers adjusted for inflation, represented in 1980 dollars[1]. As shown in Figure 1 on page 31, the average autoworker wage (adjusted for inflation) has steadily declined between 1960 and 2000. The main explanatory variable for the regression is union density, a measure of the UAW's strength or influence on company activities that impact their members, such as the collective bargaining over wages. This variable is calculated by dividing the number of UAW members (in millions by year) by the total number of production workers (who produce durable goods like cars) in the US manufacturing industry[2]. As shown in Figure 2 on page 32, the UAW's power has significantly declined since 1960, which has likely affected wages, profits, and employment in the US auto industry. A statistically significant, positive relationship between union density and the wages of autoworkers, after all other variables are controlled for, would indicate that a stronger UAW is favorable for the wages of its members.

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[1] The data for this variable was compiled by Seth Myers from a BLS union fact sheet, and was converted to 1980 dollars using the BLS's inflation calculator.

[2] The data for the number of UAW members per year comes from the Walter P. Reuther Library at the US Department of Labor, compiled by Brent Snavely. The data for number of production workers by industry comes from the US Census Bureau, published in Historical Statistics of the US, Vol. 2 pages 130-132.

There are numerous variables to be controlled for in this quantitative study. The first two variables account for the relative condition of the US economy as well as Michigan's economy, where much of the auto industry's production takes place. I include a variable measuring the unemployment rate of the United States for each year, and also a variable including the unemployment rate of Michigan[3]. There are, unfortunately, only 25 observations for Michigan's unemployment rate, as the BLS did not begin accounting for state-level unemployment until 1976. Due to the fact that unions typically have less bargaining power during times of high unemployment, with a surplus in the supply of labor and thus more competition for fewer jobs, higher unemployment should reduce the wages of autoworkers, particularly if this economic hardship is present in Michigan.

Another variable that will capture the economic conditions faced by the UAW will be the average profit rate for the US auto industry and overall manufacturing industry[4]. Unemployment tends to be a lagging indicator of economic downturns, while falling profits are a leading indicator, so this variable may have more of an immediate impact on the wages of autoworkers because the falling profits spark wage cuts and unemployment. I predict the profit rate for the industry to be inversely related to worker wages, as firms with reduced profits will cut wages to increase their low residual, the amount of money remaining after all company expenses are paid for.

Productivity, measured as the yearly output for each production worker in the US manufacturing sector (in thousands of dollars) is another variable I control for[5]. In any industry,

[3] The data for the US unemployment rate was received from the Current Population Survey, while data for Michigan's annual unemployment rate (1976-2000) was compiled by Dave Manuel from the BLS.
[4] Data for these variables was compiled from the Automotive News: Market Data Book from the BEA for the years 1960-1985 for both variables, while data for the auto industry from 1985-2000 was compiled by the Rocky Mountain Institute, and data for the manufacturing industry from 1985-2000 was compiled by Chris Harman from the ISJ.
[5] Data for this variable was taken from studies completed by the BLS and the BEA compiled by Mark J. Perry.

workers are compensated for higher levels of productivity, so I expect worker productivity to be positively correlated with the wages of UAW members. Data on the productivity of autoworkers, while preferable, was unfortunately unavailable for this study.

In addition to these variables that control for the economic conditions for each yearly observation, I also control for partisanship, the market-share of the Big Three, the public opinion about unions, and significant changes in industry-related regulations. I create a dummy variable equaling "1" if the President during the yearly observation was a Democrat, as Democrats have been shown to advocate in favor of unions while Republicans have typically been pro-business. For these reasons, I predict this variable to be positively associated with wages, as additional political support for unions increases their leverage and ability to negotiate for their members.

Another important variable I will include is the market share of the Big Three American automakers, equaling the annual number of sales by the Big Three divided by the total annual number of vehicle sales in the US measured as a percentage[6]. A stronger US auto industry would be expected to raise wages because a higher market share implies a greater demand for US automobiles, allowing producers to raise prices and later wages as profits rise. In turn, I predict that Big Three market share will be positively related to wages.

The public perception of unions may affect their power at the bargaining table as well as their membership, so a variable showing the public opinion on unions, measured as the percentage of the public that approve of the activities of unions, could affect wages[7]. I expect this variable to be positively correlated with wages, as higher public support of unions should increase their strength in collective bargaining and raise wages. Finally, new regulations imposed on the US auto industry, particularly the strict emissions standards passed in 1975, may impact

[6] Data for this variable from 1960-1977 was compiled by John Samsen and from 1978-2000 by Mark J. Perry.
[7] Data for this variable was compiled from a Gallup Poll by Jeffrey Jones.

the sales, profits, and wages of the industry. I control for the passage of this regulation by including a dummy variable equaling "1" for each yearly observation after and including 1975, and I expect this variable to be inversely related to wages as stronger regulations raise costs for employers which should induce them to press for lower wages for UAW members. Table 1 on page 20 shows a description of each variable, each variable's STATA syntax, and each variable's predicted sign in the regression. Table 2 on page 21 exhibits the descriptive statistics for each variable.

Regression Results and Analysis

Prior to reviewing the multivariate regressions, it is essential to scrutinize the strength of the linear correlations between the various independent variables and UAW wages. The Pearson's r-coefficient measures, on a scale from -1 to 1, the degree or strength of the linear relationship between two variables. Table 3 on page 22 displays the various r-coefficients that show the strength of the correlation between each explanatory variable and wages, and also presents the degree of pair-wise correlation between all of the explanatory variables.

Table 3, in agreement with my hypothesis, shows a strong positive correlation between the UAW's density and the wages of its members. The correlation coefficients also show several interactions among other factors that may affect my experiment. As expected, wages and union density were positively correlated with the market share of the Big Three. However, other correlations ran against pre-conceived notions. UAW member wages, for example, were positively correlated with unemployment and the profit rate of the auto industry, while were negatively correlated with productivity. This contradicts economic theory (Perfect Competition Labor-Market Theory) because wages typically fall when unemployment rises, when profits rise, and when worker productivity falls. Other intriguing findings that discredit my predictions

include a positive correlation between union density and the auto industry profit rate, and a strong negative correlation between union density and the productivity of manufacturing workers. However, these are simple correlations; the multi-variate regression will control for other factors.

The first regression, with the results shown on page 23 in Table 4, controlled for the average manufacturing wage ("ladjmanufwage") in the automobile wage equation to see if autoworkers are significantly affected by the wages, profits, and employment of the overall manufacturing industry, as distinct from the UAW. This proved to be correct, as most of the variables, including union density, were insignificant with the exception of manufacturing wages, which displayed a statistically significant positive relationship with autoworker wages. Some economists have argued that the auto industry is a only a fraction of the entire US manufacturing industry, and in turn the wages, profits, and employment of the auto industry adhere to the long-term trends of the overall manufacturing industry. While this hypothesis may be true, I omit the average manufacturing wage in the following regressions because manufacturing wages should be highly correlated with autoworker wages, to the extent that we see pattern-bargaining, for instance. That correlation may override and ultimately disguise other relationships in the regression between autoworker wages and union density, for example, because its strength is very significant. By omitting this variable, I am able to determine whether or not there are underlying relationships between wages and other explanatory variables that may not be as strong as the relationship between autoworker wages and manufacturing wages.

After running a regression that omitted the control variable for manufacturing wages, as shown on page 24 in Table 5, I can conclude that my hypothesis, which stated that union density should augment the wages of UAW members, was proven to be correct. First of all, the

regression boasts a very impressive 0.9574 adjusted R-squared value, which implies that the explanatory variables explain 95.74% of the variation in the dependent variable. This outcome shows that the regression is very effective at predicting the value of the wages and thus the findings deserve merit. UAW union density, the main explanatory variable, is shown to have a statistically significant, positive relationship with the wages of US autoworkers. Figure 3 on page 33 shows this statistically significant positive relationship graphically. Furthermore, the regression results exemplify other statistically significant relationships that confirm my predictions. According to the results, as the market share of the Big Three US auto producers rises, the wages of autoworkers also rise, which makes sense because a higher market share implies an increased demand for domestic automobiles, which raises the prices of the vehicles as well as the wages of the workers that produce them. The public perception of unions, as expected, was also shown to have a statistically significant positive relationship with wages, meaning that unions like the UAW had additional leverage at the bargaining table when the public approved of their activities.

Due to the fact that the adjusted R-squared value for the regression is very high, I test to determine if there is non-stationarity, heteroskedasticity, and autocorrelation present in the model to confirm the validity of the results. As shown in Table 11 on page 30, the results for the Dickey-Fuller test for stationarity, the t-statistic is a very low 0.042, which indicates that stationarity is fortunately not a problem in the model. In turn, each variable contains a unit root and was not generated by a stationary process. To test for heteroskedasticity and see if the relationships were found randomly, I conduct a Breusch-Pagan test with the results shown in Table 12 on page 30. Since the chi-square value is a low 0.47, this value is insignificant and therefore heteroskedasticity is not a problem in the model.

For autocorrelation, as shown in Table 13 on page 30, the Durbin-Watson statistic of 1.51 falls within the range of significance for a regression with 9 variables and 41 observations (at 1% significance, 0.844 – 1.876), and therefore autocorrelation is unfortunately occurring in the model. In order to correct for this autocorrelation, I utilize the "prais" STATA command to produce regression results that are corrected for autocorrelation to see if there are significant differences from the results shown in Table 5. As shown in the results in Table 6 on page 25, which are corrected for autocorrelation, there are no significant changes in the statistically significant, positive relationship between UAW union density and wages or in the significance of the model (Adjusted R-squared is unchanged). Furthermore, Big Three market share continues to have a statistically significant positive relationship, though the positive relationship between US union approval and wages becomes insignificant. Nonetheless, because the statistically significant positive relationship between wages and union density remains unchanged after correcting for autocorrelation, autocorrelation is not a serious problem in the regression results. Overall, the conclusions on stationarity, heteroskedasticity, and autocorrelation add additional support to the study's findings.

In addition to testing for stationarity, autocorrelation amongst the variables, and heteroskedasticity, I also test for structural shifts in the data. To account for structural shifts, I break the data into two separate regressions, one using data between 1960 and 1980, and the other using data between 1980 and 2000. I chose 1980 as the dividing year not only because it represents the median point in my data, but also because with the election of Ronald Reagan, the US economic perspective shifted from being pro-union to pro-business. In Table 7 and Table 8 on pages 26 and 27 are the results for two separate regressions, the first using only the data from 1960 to 1980, and the second using only data from 1980 to 2000. Note that the variables

measuring the unemployment rate for Michigan and the vehicle emissions standards were omitted from both regressions due to a lack of available data.

In Table 7, there are not many significant differences between this regression using only the first half of data and the regression using all forty years of data. Union density still has a strong positive relationship with union wages and Big Three market share also still positively affects wages (though this relationship is less significant). The main differences are that US unemployment becomes a very significant variable, with a negative relationship with wages, and that productivity also becomes moderately significant with a negative relationship with wages. Even though the negative relationship between productivity and wages contradicts economic theory, the strong negative relationship between unemployment wages confirms economic theory because, as unemployment rises, there is more competition in the labor market for fewer jobs, which decreases wages. Nonetheless, since the R-squared value is still very high and the statistically significant positive relationship between wages and density still exists, structural shifts are not present in the first half of data.

In Table 8, using data from 1980 to 2000, there also are not many significant differences from the regression using all forty years of data. Union density retains a strong positive relationship with wages, and public approval of unions still has a direct relationship with union wages. One key difference is that the coefficient for the Big Three's market share, while still significant, becomes negative, which contradicts my hypothesis of a higher market share augmenting wages for US autoworkers. Another difference is that US unemployment becomes insignificant, contrary to the first half of the data in Table 7, and that the productivity of all manufacturing workers becomes very significant with a negative relationship with wages (contradicts economic theory). Despite these minor differences, there are no significant changes

in the statistically significant positive relationship between wages and union density, in the high R-squared value of the model, and in key control variables between the regressions controlling for structural shifts and the regression utilizing all forty year of data. Hence, structural shifts are not a problem in the model as some may have anticipated given the change in ideology in the US that occurred after 1980.

Tables 9 and 10 on pages 28 and 29 show the regression results and significance rankings of a stepwise regression to see which variables have the greatest effect on autoworker wages in the model and which variables could be removed to make the model simpler while retaining satisfactory predictive ability. As shown in the results, the prior statistically significant variables (density, Big Three market share, and US union approval) remain significant, with union density fortunately having the smallest p-value in Table 9 and, therefore, the greatest impact on wages. As expected, the auto industry profit rate, unemployment for US, and environmental regulations all drop out from the results because their effects on the dependent variable are minimal at best. Despite the fact that the variable was statistically insignificant in almost all of the previous regressions, productivity was shown to have the second largest effect on wages with a very small p-value in Table 9. Furthermore, Michigan unemployment and partisanship were also listed as affecting wages, though their relationships remain insignificant in the regression results in Table 10 and are ranked to have a much smaller effect on wages compared to the other listed variables (with the exception of US union approval).

Conclusions

After conducting several multivariate regressions using time-series data, controlling for alternative explanations, and accounting for statistical flaws in the data, I can conclude that the

more influence and leverage the UAW obtained in collective bargaining, the more successful the union was in augmenting the wages of its members. As shown in Table 5 and Figure 3, union density and wages have a statistically significant positive relationship in a regression that explained over 95% of the variation in the dependent variable, which confirms the economic argument that unions raise the wages of their members. Therefore, my hypothesis, which argued that the UAW's declining union density between 1960 and 2000 significantly reduced the wages of autoworkers, was proven to be correct. A key caveat in this conclusion is that wages in the overall US manufacturing industry were omitted from the regression, so the argument that the US auto industry adheres to long-term wage trends in the manufacturing industry still deserves consideration. The study also shows other relationships between wages and several of the variables that were controlled for. A greater market share for the Big Three automakers, for example, was also shown to increase the wages of autoworkers, and a stronger public perception of unions augmented their power at the bargaining table and thus raised the wages of union members. These findings are additional evidence that can be used in future studies when considering which factors significantly affect the wages of US autoworkers.

Not only did the regression results that drove my conclusion explain almost all of the variation in the dependent variable, but they also passed several statistical tests, such as tests for stationarity, autocorrelation, and heteroskedasticity, that would have indicated a random or erroneous relationship. Furthermore, the test for structural shifts showed that the relationship was not a result of a change in ideology that occurred in 1980, as the positive relationship between union density and wages remains statistically significant throughout the two decades prior to and after 1980. Future studies reviewing this topic will hopefully have more years of data at their

disposal, and if the UAW continues to decline like many economists are predicting, the effect that this diminishing union density will have on autoworker wages must be deciphered.

In terms of policy recommendations, this paper exemplifies the fact that workers are much better off when they unionize, and that if governments want to expand opportunities and incomes for the working-class, they must pass policies that promote the creation, rights, and expansion of unions. The US middle-class reached its peak of economic prowess during the 1960s, when union density also reached its pinnacle of success. Since then, as union influence eroded, the US has seen massive increases in income inequality and minimal real-income gains for the working-class. A future study that determines if there is a relationship between union density and income inequality would add considerable merit to the idea of promoting union rights to thwart the growing income differential between the wealthy and the working-class. Given the results of this study, I would predict that union density would have an inverse relationship with income inequality, as stronger unions augment the wages of their members who typically represent the US middle-class. All in all, the US government should advocate in favor of pro-union policies to raise the wages of the working-class and reduce rising levels of income inequality.

Works Cited

Addison, John T. and Barry T. Hirsch. "Union Effects on Productivity, Profits, and Growth: Has the Long Run Arrived?" *Journal of Labor Economics* , Vol. 7, No. 1 (Jan., 1989), pp. 72-105. Print.

"Automotive and Oil Industry Profits." *The Rocky Mountain Institute*. N.p., n.d. Web. 2 Apr. 2014. <http://www.rmi.org/RFGraph-Automotive_and_oil_industry_profits>.

Automotive News: Market Data Book. 1st ed. Vol. 2. Washington, DC: US Census, 1986. Print.

Bluestone, Barry. "Negotiating the Future: A New Approach to Labor Relations in the Public Sector." NLC State Managers Conference. South Dakota, Custer State Park. 28 July 2011. Lecture.

Borjas, George J. "Job Satisfaction, Wages, and Unions." *The Journal of Human Resources* 14.1 (1979): 21-40. *JSTOR*. Web. 2 Apr. 2014. <http://www.jstor.org/stable/145536>.

Bryson, Alex. "The Effect of Trade Unions on Wages." *Reflections and Perspectives of Economic Life* 2.3 (2007): 33-45. *Cairn.Info*. Web. 2 Apr. 2014. <http://www.cairn.info/revue-reflets-et-perspectives-de-la-vie-economique-2007-2-page-33.htm>.

Budd, John W. "The Determinants and Extent of UAW Pattern Bargaining." *Industrial and Labor Relations Review* , Vol. 45, No. 3 (Apr., 1992), pp. 523-539. Print.

Card, David. "The Effects of Unions on the Structure of Wages: A Longitudinal Analysis." *Econometrica - The Econometric Society* 64.4 (1996): 957-79. *JSTOR*. Web. 2 Apr. 2014. <http://www.jstor.org/stable/2171852>.

"CPI Inflation Calculator." *U.S. Bureau of Labor Statistics*. N.p., n.d. Web. 2 Apr. 2014. <http://www.bls.gov/data/inflation_calculator.htm>.

"Current Population Survey." *US Bureau of Labor Statistics*. N.p., n.d. Web. 20 Jan. 2014. <www.bls.gov/cps>.

DeFina, Robert H. "Unions, Relative Wages, and Economic Efficiency." *Journal of Labor Economics* 1.4 (1983): 408-29. *JSTOR*. Web. 2 Apr. 2014. <http://www.jstor.org/stable/2534862>.

Freeman, Richard B., and James L. Medoff. *What Do Unions Do?* New York: Basic, 1984. Print.

Harman, Chris. "Snapshots of Capitalism Today and Tomorrow." *International Socialism Journal*. N.p., 4 Jan. 2007. Web. 2 Apr. 2014. <http://www.isj.org.uk/index.php4?id=292%22>.

"Historical State Unemployment Rates Since 1976." *DaveManuel.com*. N.p., n.d. Web. 2 Apr.

2014. <http://www.davemanuel.com/historical-state-unemployment-rates.php>.

Historical Statistics of the United States. B ed. Vol. 2. New York: Cambridge UP, 2006. Print.

Jones, Jeffrey. "In U.S., Labor Union Approval Steady at 52%." *Gallup - Inc.* N.p., 31 Aug. 2012. Web. 2 Apr. 2014. <http://www.gallup.com/poll/157025/labor-union-approval-steady.aspx>.

Lichtenstein, Nelson. *UAW Bargaining Strategy and Shop-Floor Conflict: 1946–1970.* Industrial Relations: A Journal of Economy and Society, 1985, 24: 360–381.

Myers, Seth. "Disparity on the Factory Floor." *Bloomberg.com*. Bloomberg, 18 Oct. 2012. Web. 20 Jan. 2014. <http://go.bloomberg.com/multimedia/disparity-on-the-factory-floor/>.

Perry, Mark J. "Amazing US Manufacturing Productivity Gains." *CARPE DIEM - Professor Mark J. Perry's Blog for Economics and Finance*. N.p., 7 May 2011. Web. 2 Apr. 2014. <http://mjperry.blogspot.com/2011/05/americas-amazing-manufacturing.html>.

Perry, Mark J. "The Big Three's Dramatic U-Turn." *CARPE DIEM - Professor Mark J. Perry's Blog for Economics and Finance*. N.p., 22 Jan. 2012. Web. 2 Apr. 2014. <http://mjperry.blogspot.com/2012/01/big-threes-dramatic-u-turn.html>.

Samsen, John. "Chrysler Corporation 1962: The Right Cars for the Wrong Time." *Allpar.com*. N.p., n.d. Web. 2 Apr. 2014. <http://www.allpar.com/history/plymouth/1962.html>.

Snavely, Brent. "UAW Membership up for 2nd Year in a Row." *Detroit Free Press*. N.p., 31 Mar. 2012. Web. 20 Jan. 2014. <http://www.freep.com/article/20120331/BUSINESS01/203310348>.

Table 1

Variable Descriptions and Expected Coefficient Signs

Variable Syntax (expected sign)	**Description**
ladjuawwage (dv)	Log of average wage for UAW members by year (in 1980 dollars)
uawdensity (+)	UAW density, = # of members (millions) / # of manufacturing workers
usunemp (-)	The Unemployment Rate of the United States
dempres (+)	Dummy equaling "1" if President was a Democrat during year of obs.
autoprofrate (-)	The annual profit rate for the American Auto Industry
michunemp (-)	The Unemployment Rate of the state of Michigan
big3mktshare (+)	The US market share of the Big Three automakers (US sales / total sales)
manufproduc (+)	The avg. productivity of US manufacturing workers
vecs (-)	Dummy equaling "1" if vehicle emissions standards were used in obs.
usunionapprov (+)	Percentage of US public approving of union activities (Gallup Poll)
const.	The regression's constant (or y-intercept)

Table 2

Descriptive Statistics for Each Variable

Variable	# of obs.	Mean	Standard Dev.	Minimum	Maximum
ladjuawwage	41	3.36	0.526	2.65	4.03
uawdensity	41	0.102	0.231	0.061	0.141
usunemp	41	5.98	1.44	3.4	10.3
dempres	41	0.488	0.506	0	1
autoprofrate	41	7.19	8.42	-12.7	23.8
michunemp	25	8.38	3.26	3.4	16.7
big3mktshare	41	0.771	0.084	0.61	0.91
manufproduc	41	43.9	16.84	20	82
vecs	41	0.634	0.488	0	1
usunionapprov	41	61.7	3.57	56	70

Table 3

Correlation Coefficients for Each Variable

Variable	wage	density	usunemp	dempres	profrate	michunemp	mktshare	productiv	vecs	unionapprov
wage	1.00	-	-	-	-	-	-	-	-	-
density	**0.92**	1.00	-	-	-	-	-	-	-	-
usunemp	**0.54**	0.68	1.00	-	-	-	-	-	-	-
dempres	-0.17	-0.29	-0.51	1.00	-	-	-	-	-	-
profrate	**0.51**	**0.44**	0.23	-0.03	1.00	-	-	-	-	-
michunemp	0.45	0.67	0.93	-0.67	0.17	1.00	-	-	-	-
mktshare	**0.86**	**0.74**	0.60	0.02	0.50	0.40	1.00	-	-	-
productiv	**-0.88**	**-0.94**	-0.74	0.43	-0.38	-0.73	-0.78	1.00	-	-
vecs	-0.86	-0.53	0.44	-0.07	-0.54	-0.64	-0.82	0.75	1.00	-
unionapprov	-0.52	-0.61	-0.41	0.04	-0.03	-0.39	-0.54	0.69	-0.67	1.00

Table 4

Multivariate Regression (including overall manufacturing wages)

Dependent Variable - "ladjuawwage"	N = 41 F (9, 32) = 286.75		R-squared value = 0.9942 Adj. R-squared value = 0.9908	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity	0.539	1.68	0.32	0.753
usunemp	0.034	0.023	1.48	0.159
dempres *	-0.053	0.026	-2.06	0.057
autoprofrate	-0.00056	0.00093	-0.60	0.560
michunemp **	-0.028	0.010	-2.83	0.013
ladjmanufwage ***	0.764	0.0995	7.67	0.000
big3mktshare	0.083	0.527	0.16	0.876
manufproduc	-0.0022	0.0029	-0.76	0.461
vecs	-0.004	0.004	0.97	0.64
usunionapprov	0.0099	0.007	1.44	0.17
constant	0.418	0.482	0.87	0.399

Table 5

Multivariate Regression (omitting manufacturing wages)

Dependent Variable - "ladjuawwage"	N = 41 F (9, 32) = 324.27		R-squared value = 0.9716 Adj. R-squared value = 0.9574	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity ***	10.47	2.29	4.56	0.000
usunemp	-0.029	0.046	-0.65	0.527
dempres	-0.074	0.055	-1.34	0.199
autoprofrate	-0.0015	0.002	-0.74	0.471
michunemp	-0.0235	0.021	-1.10	0.289
big3mktshare **	2.665	0.871	3.06	0.007
manufproduc	-0.0041	0.0062	-0.66	0.519
vecs	-0.1007	0.062	-1.64	0.112
usunionapprov *	0.029	0.014	2.11	0.051
constant	-0.948	0.961	-0.99	0.338

Table 6

Multivariate Regression, Adjusted for Autocorrelation

Dependent Variable - "ladjuawwage"	N = 41 F (9, 32) = 104.13		R-squared value = 0.9812 Adj. R-squared value = 0.9717	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity **	9.889	2.38	4.15	0.001
usunemp	-0.0059	0.042	-0.14	0.890
dempres	-0.0809	0.0512	-1.58	0.134
autoprofrate	0.00003	0.0021	0.01	0.990
michunemp	-0.0321	0.0211	-1.52	0.148
big3mktshare *	1.942	0.907	2.14	0.048
manufproduc	-0.0052	0.0062	-0.94	0.413
vecs	-0.1009	0.061	-1.65	0.110
usunionapprov	0.0188	0.0135	1.39	0.183
constant	0.223	0.985	0.23	0.824

Table 7

Regression Testing for Structural Shifts (1960-1980)

Dependent Variable - "ladjuawwage"	N = 21 F (7, 13) = 34.45		R-squared value = 0.9488 Adj. R-squared value = 0.9213	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity **	5.86	2.14	2.74	0.017
usunemp ***	-0.064	0.013	-5.19	0.000
dempres	-0.051	0.036	-1.44	0.174
autoprofrate	-0.005	0.004	1.47	0.166
big3mktshare *	1.74	0.965	1.80	0.095
manufproduc *	-0.016	0.0084	-1.85	0.088
usunionapprov	0.0042	0.0156	0.27	0.790
constant *	2.21	1.16	1.91	0.079

Table 8

Regression Testing for Structural Shifts (1980-2000)

Dependent Variable - "ladjuawwage"	N = 21 F (7, 13) = 122.41		R-squared value = 0.9851 Adj. R-squared value = 0.9770	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity **	3.51	1.41	2.49	0.027
usunemp	-0.009	0.0107	-0.84	0.417
dempres	0.0492	0.0340	1.45	0.171
autoprofrate	-0.00092	0.00094	-0.99	0.342
big3mktshare *	-1.12	0.613	-1.83	0.090
manufproduc ***	-0.0151	0.0035	-4.26	0.001
usunionapprov *	0.0135	0.0071	1.88	0.082
constant ***	3.464	0.729	4.75	0.000

Table 9

Stepwise Regression Significance Rankings

P-value = X < 0.2000	Variable (ranked by significance)
P = 0.0000 < 0.2000	UAW Density
P = 0.0024 < 0.2000	Productivity
P = 0.0040 < 0.2000	Big Three Market Share
P = 0.0651 < 0.2000	Michigan Unemployment
P = 0.1982 < 0.2000	US Union Approval
P = 0.1826 < 0.2000	Partisanship

Table 10

Stepwise Regression Results

Dependent Variable - "ladjuawwage"	N = 21 F (7, 13) = 162.53		R-squared value = 0.9858 Adj. R-squared value = 0.9798	
Variable	**Coefficient**	**Standard Error**	**t-statistic**	**P-value**
uawdensity **	3.671	1.286	2.85	0.013
manufproduc ***	-0.015	0.0032	-4.89	0.000
big3mktshare **	-1.178	0.457	-2.58	0.022
michunemp	-0.0072	0.0047	-1.54	0.145
usunionapprov *	0.012	0.0064	1.88	0.082
dempres	0.0442	0.0315	1.40	0.183
constant ***	3.61	0.562	6.42	0.000

Table 11

Dickey-Fuller Test for Stationarity

Dickey-Fuller Test	1% Critical Value	5% Critical Value	10% Critical Value
t-statistic = 0.042 P-value = 0.9619	-3.648	-2.958	-2.612

Table 12

Breusch-Pagan Test for Heteroskedasticity

Breusch-Pagan Test	Chi-square (1)	Prob. > chi-square
No Heteroskedasticity Present	0.47	0.4933

Table 13

Durbin-Watson Test for Autocorrelation

Durbin-Watson Test	Lower Limit	Upper Limit
DW-stat (9,41) = 1.51	0.844	1.876

Figure 1

The Decline in Wages for UAW Members from 1960 to 2000

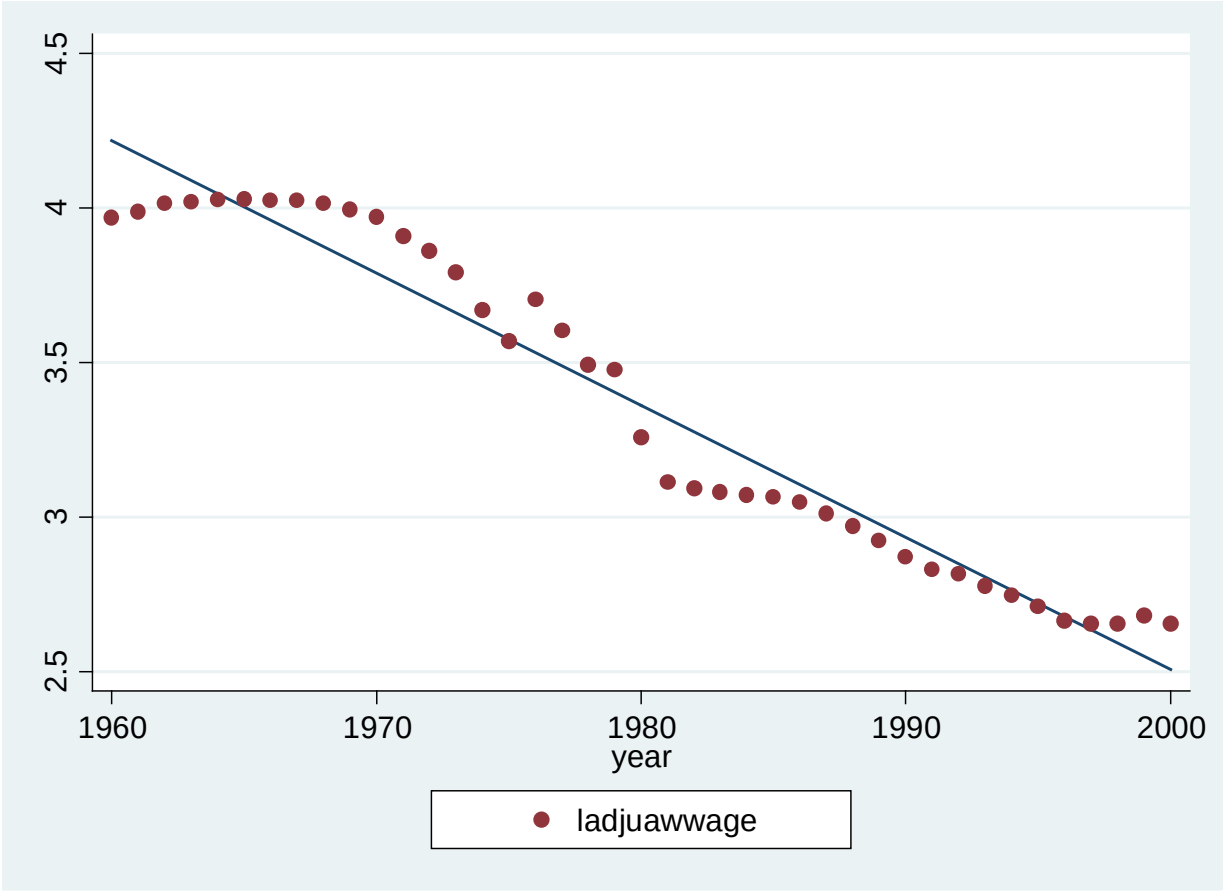

Figure 2

The Decline in UAW Density from 1960 to 2000

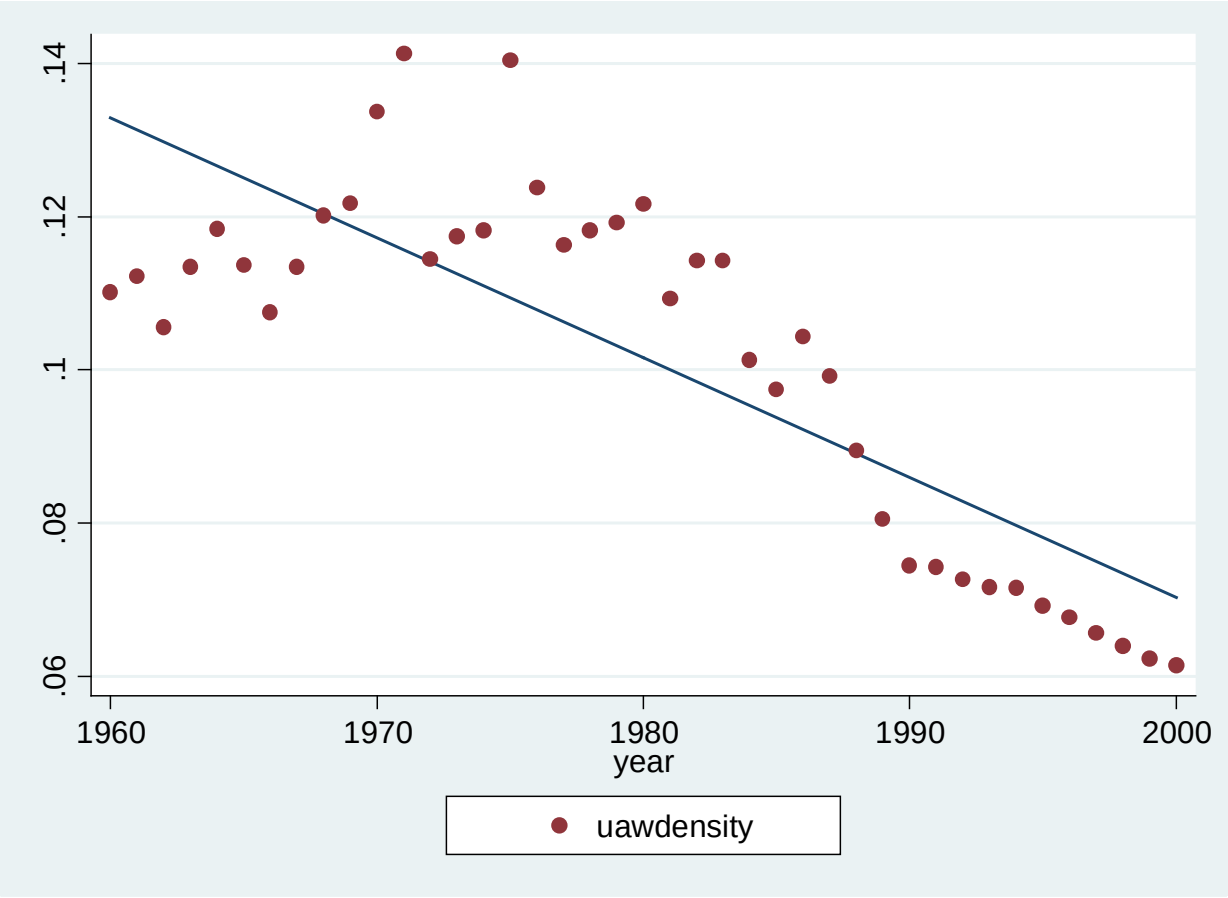

Figure 3

The Positive Relationship between UAW Union Density and Wages