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## The Impact of Economic Indicators on the Decreasing Popularity of Labor Unions in the US

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**The Impact of Economic Indicators on the Decreasing Popularity of Labor Unions in the U.S. by**  
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Honors Project  
**Spring, 2024**

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This Honors Project has been approved and accepted by the John Carroll University Honors Program, in partial fulfillment of the requirements for an Honors Diploma.

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**May 6, 2024**  
Date

## *Introduction*

Throughout their history, labor unions have been tools for workers to achieve better benefits, pay, and working conditions. Despite union benefits helping workers by holding firms accountable, labor unions have been decreasing in popularity over the past 20 years. A possible explanation for this is the impact unions have on both labor demand and supply. On the worker side, labor unions are tools to improve wages, as well as protect workers from harm and unfair working conditions. However, there are legitimate societal implications on the producer side, such as firms not being able to maximize efficiency, among others. It is still difficult to reconcile why unions are decreasing in popularity though, as workers will likely make individual decisions when deciding to unionize. This suggests bigger economic factors playing a major role in the popularity of labor unions in the United States.

The goal of this paper is to analyze several economic factors that are assumed to impact participation within labor unions through a series of regression models. Some examples include GDP, unemployment, worker productivity, annual wage, and the wage premium, among others discussed in literature. It will also isolate populations by education level to determine whether wage benefits impact populations in labor unions differently. The goal of the analysis is to determine which factors impact labor unions the most and why. More importantly, it will look to determine if these factors influence the decline in labor union popularity, and if not, what economic or noneconomic reasons could be causing this decline.

## *Literature Review*

There were several sources I looked into that addressed the role of macroeconomic variables on union popularity. Specifically, these sources dealt with GDP, worker productivity, and unemployment. Borjas provides insight regarding the relation between GDP and union involvement, primarily through the concept that monopoly unionism prevents maximum

company output. Monopoly unionism is essentially union control of labor. They set the price of labor, causing firms to look at their needs to determine the number of workers hired. This often creates a lack of positions for the supply side of the labor market through the increased cost of labor. At the same time, companies lose the ability to work at maximum efficiency (Borjas 370). Although there are other negotiation methods that help mitigate this reduction in national income, it is unreasonable to assume that all firms can perfectly maximize union efficiency. Therefore, the concept of monopoly unionism implies that unions negatively affect GDP.

Doucouliagos and Laroche conducted a study to determine the impact of worker productivity and union popularity. There were two main issues addressed in this analysis: consistency and relevance. Countries such as the United Kingdom showed negative correlation while the United States showed a positive correlation. It was also pointed out that more research needs to be done to prove correlation, as productivity has a significant number of variables attached to it (32-33). With this in mind, it would be impossible to draw any possible conclusions regarding productivity and unionism internationally. One explanation of this is due to differences in labor markets in various countries. However, when isolating the United States in their study, Doucouliagos and Laroche identified a positive correlation between worker productivity and union popularity.

Bussing-Burks suggests that although there are indications of correlation between unemployment and union popularity, research has shown that increased union involvement decreases employment for younger and older candidates. She argues, “union wage-setting policies price the young and elderly out of employment and drive affected individuals in these groups to non-labor-force activities, leaving unemployment rates unchanged” (Bussing-Burks). Given these justifications, Bussing-Burks indicates no significant impact between

unemployment and union popularity. Even with this, it is still important to test this hypothesis, as common sense offers the idea that with companies paying union workers more, they cannot hire as many workers as normal, decreasing employment.

There are a significant number of sources that analyze labor union impact on worker health, wellbeing, benefits, and salary. Therefore, conclusions can be drawn regarding decreases in unionization throughout the years through the impact of these benefits. Although many sources will not overlap with the analysis done in this paper directly, they will nicely complement the results through evidence of decreasing union popularity without the effect of macroeconomic factors.

The Bureau of Labor Statistics (BLS) provides insight into which industries favor labor unions over others, as well as an update on the state of union popularity. According to a January 23, 2024, News Release, the union membership rate has not changed much in the past year. However, sitting at 10% in 2023, is just over half of what it was in 1983, which boasted a 20.1% union membership rate for wage and salaried employees. The actual number of union workers was 14.4 million last year and 17.7 million in 1983 (Bureau of Labor Statistics 1). These figures are quite interesting, as it shows that the labor force has grown during that time, but labor unions have not grown with it. When looking at the number of workers in 1983 and 2023, the decrease of 3.3 million workers in unions does not seem severe, but when compared to differences in labor force sizes in both respective years, it is about a 50% decrease.

The News Release also includes information comparing union popularity in various sectors and industries. According to the BLS, the public sector dominates the private sector with regards to union membership rate at a staggering 32.5% to 6%, respectively. In the public sector, the highest union membership rate was held by the government, which employs police, firefighters, and teachers. In the private sector, utilities, transportation, and warehousing

industries saw higher union membership rates, while finance and technical services were least popular (1-2). These data points provide a baseline on where to focus industry specific analysis. With this information, it will be possible to compare the impact of economic indicators on labor union popularity between different sectors and industries.

One issue with the Bureau of Labor Statistics' News Release is the lack of answers to support the data it presents. Specifically, it provides results from the sample studied, but offers no conclusions as to why the results look the way they do. Chen and Islam, in their 2023 study regarding union popularity and worker well-being, seems to provide an answer to this. Through their analysis of isolating happiness as a variable, they concluded that unionization, in general, increases overall happiness of both unionized workers and society. However, they also discovered that "Individuals toward the lower end of the income distribution, including those without a college education and current or former blue-collar job holders, are the primary beneficiaries of union efforts" (Chen and Islam 304). In fact, these marginalized demographics profit from union benefits other than happiness. Chen and Islam recognize the importance of on-the-job safety, work-life balance, and interpersonal trust for these workers, even over union salary benefits. Health benefits specifically are appreciated the most by low-status workers, as many of these jobs require strenuous activity (304). Comparing these conclusions with the data from the Bureau of Labor Statistics, trends are beginning to form between who benefits from unions the most and where the highest density of labor unions exists.

Looking at another resource from the Bureau of Labor Statistics, it is possible to see these trends. The BLS has a published chart of the percent of workers with at least a bachelor's degree in various industries for the year 1998. Although this data is rather old, it is still relevant given typical job requirements. First, let's examine industries that, according to the Bureau of Labor Statistics, have the highest densities of labor unions. In the private sector, unionization rates in

the utilities and transportation industries were 19.9% and 15.9% respectively (Bureau of Labor Statistics 2). Comparing that with education in those specific workforces, only 20% of workers had a college education between both industries. Another popular industry for labor unions, manufacturing, only sees 21% of their labor force with a bachelor's degree. Inversely, 37% of finance workers have earned at least a bachelor's degree, compared to only a 1.2% unionization rate in the industry (Bureau of Labor Statistics). This connects well with Chen and Islam's study, as according to them, workers without an education benefit the most from union involvement. Therefore, it would make logical sense that unions are most present in industries where workers appreciate union benefits the most. This also applies to the public sector, considering careers as police officers and firefighters come with many risks that unions can mitigate through on-the-job safety requirements. Similarly, educators benefit from union ability to provide more stable wages and job security.

The question then becomes why unions are still decreasing in popularity even in industries with strong unionization rates, according to the BLS. The answer has to do with an economy dealing with a constantly changing demand. Technological advancement is adjusting job markets, shifting the need from producing durable goods to a need of service jobs, causing artificial intelligence to lower labor demand in some blue-collar industries (Chen and Islam 305). With these decreases in labor demand for industries overwhelmed by lower income and lower education individuals, less jobs become available, which in turn decreases opportunity for labor union density. Therefore, technological advancements do not only cause threat to the happiness and health of blue-collar workers, as Chen and Islam are concerned, but also harm opportunities for a resurgence of labor union popularity.

Some other studies have analyzed decreasing usage of labor unions with regards to employee compensation and wages. For instance, Matthew Knepper studies the impact of

unions on worker benefits. The reasoning behind this analysis is the lack of evidence backing the belief that “labor unions increase employer costs by using their bargaining power to negotiate higher wages,” (Knepper 99) as shown by DiNardo and Lee. After conducting his analysis, Knepper concluded that unions increase average worker compensation by as much as 7% to 10%. When compared to declines in unionization between 1983 and 2016, this accounts to an estimated loss of compensation benefits to the amount of \$56 billion to \$80 billion (Knepper 109). What Knepper fails to answer in his paper is: if this is the case, why are unions still decreasing in popularity? A different paper sheds light into this answer, although it strays away from benefits and compensation and focuses on wage-based benefits.

DiNardo and Lee concluded that, in recent years, unions have been less successful raising wages for their members than in prior years (1431). In the interpretation of the data section of the paper, the authors fail to find “evidence that employers raise wages in response to an increased risk of unionization brought upon by a future certification election” (1428-1429). In other words, they found two things: rumors of unionization do not play any significance to raising worker pay and new unions struggle to adequately improve wage-based benefits for union members. With regards to shortcomings, DiNardo and Lee mention that the sample consists of “young” unions, those that are twenty years old or younger. They acknowledge that these unions are likely weaker than larger, long-established unions. Therefore, their conclusions may vary with a sample adjustment and recalculation (1429). Although this may come as concern for validity of the study, I believe that this provides strong insight into decreasing union popularity. The conclusions drawn by DiNardo and Lee indicate that workers may struggle to see benefits from new unions, indicating a possible disincentive to bargain for a union in a small company. Unionization rates in successful and long-established unions still may be high, but these results could demoralize workers looking to create a new union.



Another explanation of decreased union popularity may be linked to declining union wage premiums, as shown by Blanchflower and Bryson. A union wage premium is the difference in wage a worker would make in a union as opposed to not in a union. In their paper, they acknowledge that compared to the 1970s, the private sector union wage premium is lower, but not as low as expected. One possible explanation for this is the declining union popularity itself, as with less workers in unions, the supply of non-union workers increases, decreasing the wage for non-union workers (Blanchflower and Bryson 26). Branching off this idea creates an interesting relationship. Assuming the opposite being true: an increase in supply of union workers would decrease the wage for union workers, the wage premium would decrease even more than it has compared to the 1970s. A decrease in the wage premium would disincentivize workers from joining unions, decreasing the demand for them. This would validate points from DiNardo and Lee as well as answer the question based on Knepper. With respect to DiNardo and Lee, new unions will increase the supply of union workers, creating a decrease in the wage premium. This would explain why employers would see no need to raise wages in response to unionization risk. For Knepper, it demonstrates that although compensation benefits generally increase with unionization, the sample of workers responds to wage-based incentives. Historical decreases in the wage premium could explain why union demand in the labor market is decreasing.

### *Methodology and Analysis*

The methodology of this paper will deal with a series of regression models, expanding on three main topics: the impact of larger economic variables (GDP, worker productivity, and unemployment) on union popularity, the impact of average annual wage on union popularity, and the impact of union wage on union popularity when isolating education levels.

### Impact of GDP, Worker Productivity, and Unemployment on Union Popularity

The first regression will test the significance of GDP and worker productivity on the popularity of labor unions. Given the concept that monopoly unionism will prevent companies from maximizing output, I predict a negative correlation between GDP and union popularity. If GDP is growing, monopoly unionism is not preventing companies from maximizing efficiency, meaning there is likely a decrease in union density. As for worker productivity, I predict a positive correlation, as Doucouliagos and Laroche indicated a positive correlation between productivity and unionization in the United States. The variables studied can be defined as:

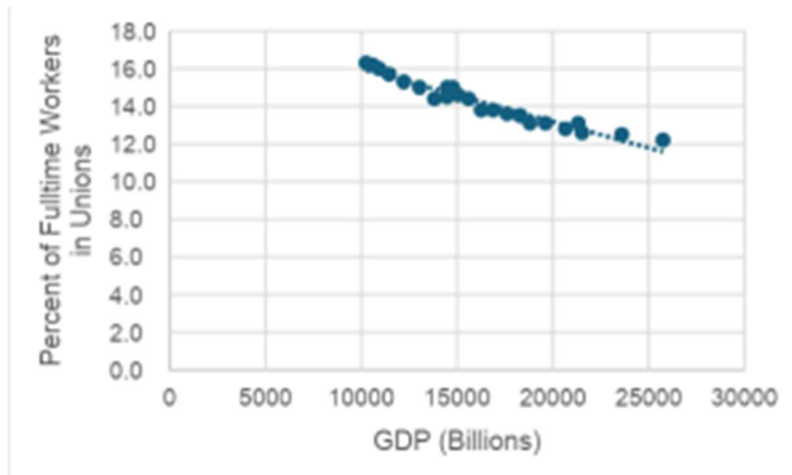
- *Number of Workers in Unions*: % of employed, full time wage and salary workers represented by unions in the United States, per the Bureau of Labor Statistics
- *Worker Productivity*: % change of nonfarm business labor productivity in the United States, measured by worker output/hour, per the Bureau of Labor Statistics
- *GDP*: United States gross domestic product in billions of dollars, per the Bureau of Economic Analysis
- *Sample*: 2000-2022

The following is the output received from the regression:

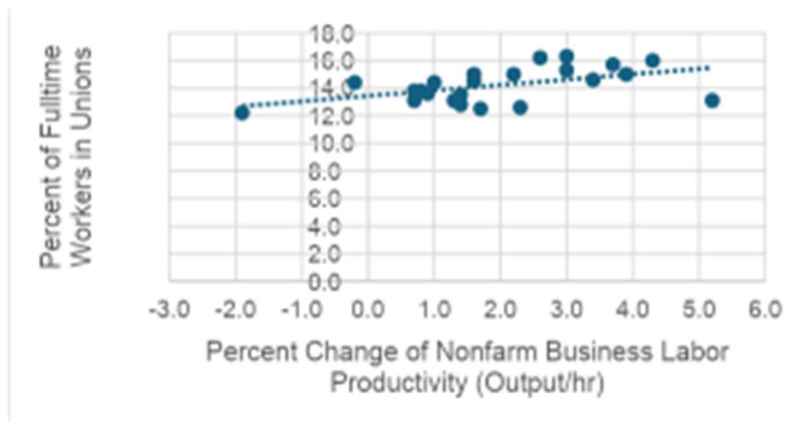
*Regression Depicting Impact of GDP and Worker Productivity on Union Popularity*

Regression Statistics								
Multiple R	0.970770235							
R Square	0.942394849							
Adjusted R Square	0.936634334							
Standard Error	0.310948538							
Observations	23							
ANOVA								
	df	SS	MS	F	gnificance F			
Regression	2	31.63578535	15.8179	163.596	4E-13			
Residual	20	1.933779866	0.09669					
Total	22	33.56956522						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	18.46874068	0.341922081	54.0145	3.8E-23	17.7555	19.182	17.7555	19.182
GDP (billions)	-0.000268435	1.73633E-05	-15.4599	1.4E-12	-0.0003	-0.00023	-0.0003	-0.00023
Worker Productivity	0.065178599	0.046964607	1.38782	0.18046	-0.03279	0.16315	-0.03279	0.16315

*Scatterplot Showing Relationship Between GDP and Union Popularity*



*Scatterplot Showing Relationship Between Worker Productivity and Union Popularity*



Given the F statistic, the model was statistically significant. The value of  $4E-13$  is much lower than the alpha of  $.05$ . The R-square of the regression shows that 94.23% of variation in labor union popularity is explained by the model.

Out of the two variables, the one with the most significance was GDP, with a  $1.4E-12$  P-value. According to the model, for every unit of GDP, labor union popularity decreases by 0.000268%, implying negative correlation. This negative correlation agrees with the hypothesis: not all firms that have labor unions are going to be able to maximize efficiency, and therefore, labor unions still hurt GDP. As a result, as GDP increases, there is likely to be a decrease in the number of workers in labor unions.

Worker productivity had a much weaker correlation, with a P-value of 0.18046. However, it had a positive correlation, as for every unit of worker productivity, labor union popularity increased by 0.065%. Compared to GDP, variation in worker productivity causes larger changes in the number of workers in unions. Despite not being very significant, the relationship is positive, implying that an increase in labor union participation may be partially influenced by worker productivity.

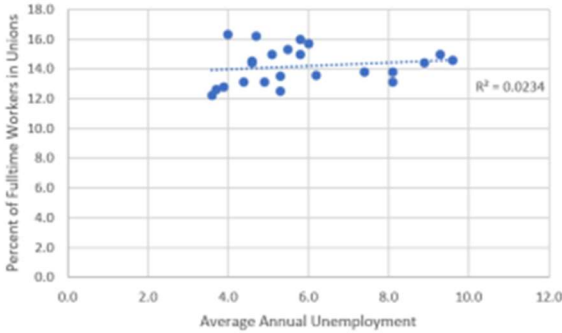
This regression provides an update to a prior study that also incorporated unemployment as an independent variable. In that regression, I predicted unemployment having no correlation to union popularity, as according to Bussing-Burks, union wage policies often decrease the

labor force instead of the actual unemployment rates. Given the definition of the variable as the average annual unemployment rate in the United States, per the Bureau of Labor Statistics, the following are the results from the original analysis:

*Regression Depicting Impact of Unemployment, GDP, and Worker Productivity on Union Popularity*

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.970946118							
R Square	0.942736364							
Adjusted R Square	0.933694737							
Standard Error	0.318079381							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	3	31.64724986	10.54908	104.2662	5.57413E-12			
Residual	19	1.922315357	0.101174					
Total	22	33.56956522						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	18.54069007	0.409901108	45.23211	8.23E-21	17.6827572	19.39862295	17.6827572	19.39862295
Avg Annual Unemployment	-0.013023164	0.038687823	-0.336622	0.740092	-0.093997708	0.06795138	-0.093997708	0.06795138
GDP (billions)	-0.000268643	1.77723E-05	-15.11586	4.81E-12	-0.000305841	-0.000231445	-0.000305841	-0.000231445
Worker Productivity	0.069192379	0.049499218	1.397848	0.178267	-0.034410674	0.172795432	-0.034410674	0.172795432

*Scatterplot Showing Relationship Between Unemployment and Union Popularity*



Comparing the two regressions as a whole there is not too much of a difference. The only major change present is that the F value including unemployment as a variable is 5.57E-12, which is still statistically significant. The R square statistic has also barely changed, along with

the values for GDP and worker productivity. The biggest difference can be seen when looking at the results for average annual unemployment.

Compared to the other two variables, unemployment had by far the least amount of significance, demonstrated by its P-value of 0.7401. Despite having little to no significance, for every unit of unemployment, labor union popularity decreased by 0.013%, indicating negative correlation. This agrees with the historical unemployment rate in the United States logic provided by Bussing-Burks. However, the lack of significance aligns with the idea that labor unions cause workers to move out of the labor force.

The first regression run in this study excluded unemployment for two reasons: to declutter the regression and to test the difference in the results when removing an insignificant variable. However, when comparing the original regression to the updated one, it is possible to see that despite average annual unemployment not having significance with labor union popularity, it did not skew the results of the regression.

#### Impact of Wage on Union Popularity

The second variation will add another variable to the regression: average hourly wage. The description of the added variable is:

- *Average Hourly Wage*: Average hourly earnings of all non-supervisor hourly workers (excluding government workers) in the United States, per the Bureau of Labor Statistics

The new regression will reintroduce average annual unemployment as a variable. The results of the new regression are:

*Regression Depicting Impact of Unemployment, GDP, Worker Productivity, and Average Hourly Wage on Union Popularity*

Regression Statistics								
Multiple R	0.991112047							
R Square	0.98230309							
Adjusted R Square	0.978370444							
Standard Error	0.181670881							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	4	32.97548766	8.243872	249.7817	1.67534E-15			
Residual	18	0.594077561	0.033004					
Total	22	33.56956522						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	14.88228971	0.622394815	23.91133	4.32E-15	13.57468673	16.1898927	13.57468673	16.1898927
Avg Annual Unemployment	-0.18380269	0.034827723	-5.277482	5.11E-05	-0.25697302	-0.110632359	-0.25697302	-0.110632359
GDP (billions)	-0.001202105	0.000147494	-8.150184	1.88E-07	-0.001511979	-0.000892231	-0.001511979	-0.000892231
Worker Productivity	-0.010926191	0.030964097	-0.352866	0.728287	-0.075979344	0.054126962	-0.075979344	0.054126962
Average Hourly Wage	1.01445314	0.159911389	6.343845	5.62E-06	0.678491779	1.350414502	0.678491779	1.350414502

There is a lot to unpack from this. First, the F Statistic shows that the regression is still significant with the addition of hourly wages, as the value of 1.67E-15 is less than the alpha of .05. The R-square statistic also implies an improved data set, as it indicates that 99.11% of variation in labor union popularity is explained by the regression model. The major changes arise in the significance of each independent variable.

Like the original model, GDP is still statistically significant to labor union popularity. Its P-value and coefficient have changed by a large amount, but not enough to change the conclusion about GDP's significance to labor union popularity. The new variable, average hourly wage, is significant with a P-value of 5.62E-06, which is the second strongest in the regression after GDP. Its coefficient implies that for every dollar of hourly wage, labor union popularity increases by 1.014%, indicating a positive correlation. The other two variables have changed drastically. The P-value for worker productivity has spiked from the original 0.178 to 0.728, indicating little to no significance in the new regression model. Oppositely, the P-value for average annual unemployment has dropped from 0.74 to 5.11E-05, implying now that it is statistically significant. These drastic changes give for concern, with a possible solution being that multicollinearity is affecting the results of this regression.

Multicollinearity is when two independent variables have a very high correlation so that the relationship skews the results of an analysis. Given the nature of discovering the potential issue, a variance inflation factor (VIF) will be calculated to determine if any of the independent variables are skewing the results of the sample. I will calculate a VIF for each individual relationship between all four independent variables using the formula  $1 / (1 - R^2)$  where R squared is the coefficient of determination for each relationship. A VIF of 1 indicates no correlation, 1-5 indicates moderate correlation, and anything above 5 being highly correlated (Investopedia). The following were the results of the calculation, with the top chart depicting the R values and the bottom chart depicting the VIF:

*Calculation of Variance Inflation Factors*

	<i>Unemployment</i>	<i>GDP (billions)</i>	<i>Productivity</i>	<i>Average Wage</i>
<i>Avg Annual Unemployment</i>	1			
<i>GDP (billions)</i>	-0.157885797	1		
<i>Worker Productivity</i>	0.283546292	-0.452044566	1	
<i>Average Hourly Wage</i>	-0.072211182	0.993935998	-0.406582246	1
	<i>Avg Annual Unemploj</i>	<i>GDP (billions)</i>	<i>Vorker Productivit</i>	<i>Average Hourly Wage</i>
<i>GDP (billions)</i>	1.025565213			
<i>Worker Productivity</i>	1.087427543	1.256825015		
<i>Average Hourly Wage</i>	1.005241788	82.70455327	1.198048316	

Comparing all the variables, only two are highly correlated: GDP and Average. These independent variables have a VIF score of 82.7, which is astronomically high and is likely the main source of issue in the analysis. With that much correlation, it would be reasonable to assume that the other two variables were affected by the relationship between GDP and wage as well. In other words, even though average annual unemployment and worker productivity are only moderately correlated and not of much concern, they were still skewed because of how inaccurate the regression was in predicting the relationship between union popularity and GDP. Given that there are no multicollinearity concerns between the original three variables, the



easiest adjustment to make is to run a separate single variable regression for average hourly wage. The results of the new regression are:

*Regression Results Isolating Average Hourly Wage as Independent Variable*

Regression Statistics	
Multiple R	0.947394364
R Square	0.897556081
Adjusted R Square	0.892677799
Standard Error	0.404674933
Observations	23

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	30.13056739	30.13056739	183.9902052	7.36385E-12
Residual	21	3.438997824	0.163761801		
Total	22	33.56956522			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	20.21166026	0.451473279	44.76823146	2.53005E-22	19.27277018	21.15055034	19.27277018	21.15055034
Average Hourly Wage	-0.303425696	0.022369434	-13.56429892	7.36385E-12	-0.349945482	-0.25690591	-0.349945482	-0.25690591

When calculated separately, average hourly wage is still statistically significant to change in labor union popularity, as its P-value of 7.36E-12 is significantly below the alpha level of .05. What is surprising is contrary to the original regression, there is a negative relationship between the two variables. This could be seen as confusing, as one might expect higher wages to indicate an increase in union popularity. However, recalling the work of Chen and Islam, this makes sense for two reasons. For one, their study made a point of emphasis on the favored benefits of labor unions being safety based as opposed to monetarily based. More importantly, if it is true that most workers benefiting from labor unions are blue-collar and or lack a college degree (304-305), then this inverse relationship would make sense. The jobs these workers are taking are likely lower paid jobs compared to those requiring a college degree, while the higher paying positions will have a lower need for a union. Therefore, although labor unions can provide a benefit of increased wages, high paying positions do not increase the density of unions. Building off this, the workers seeking unions tend to prefer non wage benefits, implying that a net increase in wage would take away from the non wage benefits offered, and therefore, decrease union popularity. Nonetheless, the regression correcting the multicollinearity issue displays correlation that increases in average annual wages decrease the popularity of unions.

## Impact of Union Wage on Union Popularity Given Different Education Levels

To further analyze the impact of wages on labor union popularity, I will now compare the impact of union wage and the wage premium between two populations: those with at least a bachelor's degree and those with education levels lower than a bachelor's degree. The goal of this is to compare benefits between workers in different populations who may incentivize different benefits when making a decision to unionize. There will be two variables tested in both samples to determine this relationship:

- Union Wage: Mean wage among union members in the given population
- Wage Premium %: The difference between union and nonunion wage, calculated as the percentage difference between the wages

The sample will be taken from 2000-2022, the same as the previous regressions, with the previous independent variables being tested against the union membership percentage for workers with at least a bachelor's degree and those without a bachelor's degree, respectively.

The expectation for the impact of union wage is a negative correlation in both samples. This is due to the many studies previously mentioned that concluded that workers benefit from unions through non-wage benefits. Therefore, if union wages were to rise, workers would likely lose out on other benefits that may impact them more, causing a decrease in labor union popularity. Essentially, the prediction aligns with the prior regression testing wage's impact on labor union popularity. However, I expect the impact of union wage to be much smaller for those with a college education, with the rationale that workers with a bachelor's degree tend to take safer jobs, and therefore, will not rely on non wage union benefits as much as the other population. This idea is shown in the Bureau of Labor Statistics' chart, where, for instance, 39% of service industry workers have at least a bachelor's degree, compared to only

10% of construction workers. As a result, an increase in union wage will not negatively affect this population as much. With this in mind, the following are the results of the regressions:

*Regression Depicting Impact of Union Wage on Union Popularity for Workers With Less Than a Bachelor's Degree*

Regression Statistics								
Multiple R	0.940203621							
R Square	0.883982849							
Adjusted R Square	0.878458222							
Standard Error	0.004139813							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0.0027422	0.00274222	160.008	2.738E-11			
Residual	21	0.0003599	1.7138E-05					
Total	22	0.0031021						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
< Bachelor's Degree	0.174993455	0.0053473	32.72542156	1.7E-19	0.1638731	0.186113826	0.1638731	0.186113826
Union Wage	-0.00290113	0.0002293	-12.64941578	2.7E-11	-0.003378	-0.002424173	-0.0033781	-0.002424173

*Regression Depicting Impact of Union Wage on Union Popularity for Workers With at Least a Bachelor's Degree*

Regression Statistics								
Multiple R	0.95134							
R Square	0.90505							
Adjusted R Square	0.90052							
Standard Error	0.00365							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0.00267	0.00267	200.157	3.306E-12			
Residual	21	0.00028	1.3E-05					
Total	22	0.00295						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
> Bachelor's Degree	0.19634	0.00448	43.7985	4E-22	0.18701608	0.205660941	0.187016077	0.205660941
Union Wage	-0.00203	0.00014	-14.1477	3.3E-12	-0.0023292	-0.001732169	-0.002329155	-0.001732169

Looking at the P-values in each regression, it seems as if union wage is statistically significant in both cases, as both are well below the alpha level of .05. The actual impact of union wage on labor union popularity introduces unexpected results, as it is essentially the same in both cases. For workers without a bachelor's degree, for every dollar increase in union wage, labor union participation decreases by 0.0029. For workers with at least a bachelor's degree, for every dollar increase in union wage, labor union participation decreases by 0.00203.

The prediction was correct in saying union wage would have a smaller impact on workers with at least a bachelor's degree, but the difference in impact is practically negligible. What is surprising about these results is how small the impact is for workers without a bachelor's degree. One possible explanation for this being the case is the difference between the population the "wage" variable encompasses between these regressions and the previous one. In the previous regression testing the significance of average annual wage on labor union popularity, the impact of wage was much larger. However, this variable includes non union workers' wages as well, while these two regressions focus solely on union wages. Although unanticipated, this does make sense in the context of past work. Despite some workers appreciating non-wage benefits more than wage increases (Chen and Islam), some workers may favor the increased wage over other benefits. Therefore, the small impact makes sense even if the benefit is unfavorable compared to others.

Shifting the topic to wage premium's impact on the two populations, I predict a positive relationship, but the introduction of a cycle of union popularity. This is based on the economic principles of labor supply and labor demand, as well as the analysis of Blanchflower and Bryson, where if the supply of non-union workers increases, the wage for non-union workers decreases (26). Similarly, if wage premiums were to increase, supply of union workers, and therefore, union population should, in theory increase. However, this rightward shift in labor supply will decrease union wage. Over time, this decrease in union wage will lower the wage premium, disincentivizing union workers, and decreasing union popularity, forming a cycle. Although union popularity may decrease through this cycle, it follows the wage premium in the same direction, justifying a positive relationship for both education levels. The results of the regression are:

*Regression Depicting Impact of the Wage Premium on Union Popularity for Workers With Less Than a Bachelor's Degree*

Regression Statistics								
Multiple R	0.044255244							
R Square	0.001958527							
Adjusted R Square	-0.045567258							
Standard Error	0.012142102							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	6.076E-06	6.07558E-06	0.04121	0.8410876			
Residual	21	0.003096	0.000147431					
Total	22	0.0031021						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
< Bachelor's Degree	0.101128613	0.0351228	2.879283818	0.00898	0.0280867	0.174170549	0.0280867	0.174170549
Wage Premium %	0.017237123	0.0849111	0.203001895	0.84109	-0.159345	0.193819512	-0.1593453	0.193819512

*Regression Depicting Impact of Union Wage on Union Popularity for Workers With at Least a Bachelor's Degree*

Regression Statistics								
Multiple R	0.75275							
R Square	0.56663							
Adjusted R Square	0.546							
Standard Error	0.0078							
Observations	23							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	0.00167	0.00167	27.4576	3.4082E-05			
Residual	21	0.00128	6.1E-05					
Total	22	0.00295						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
> Bachelor's Degree	0.15992	0.00524	30.5377	6.9E-19	0.14903292	0.170814501	0.149032919	0.170814501
Wage Premium %	0.35172	0.06712	5.24	3.4E-05	0.21213151	0.49130691	0.212131509	0.49130691

The two education levels provide very different results. First, there is little to no significance between the wage premium and labor union density for workers without a bachelor's degree, as seen by the P-value of 0.841 compared to the alpha of .05, as well as the extremely low R Square statistic. One possible explanation as to why there is little correlation could relate to what benefits this demographic of workers tend to look for. Given that blue-collar job holders and workers without a college education see the most direct impact to union efforts, and that union involvement increases worker well-being (Chen and Islam 304), this group of workers may be immune to the cycle predicted. With workers in these groups appreciating unions for well-being improvements and overall happiness, these workers may be

incentivized to join unions with lower wage premiums. In other words, the wage premium is not a benefit these workers consider when making a decision to join a union, and therefore, it holds no significance to the union membership rate.

Alternatively, despite only explaining 56.663% of variation in union popularity for workers with at least a bachelor's degree, wage premiums show significance with a P-value of 3.4E-5. In fact, a 1% increase in the wage premium will increase labor union popularity for workers with a college education by 0.3517%, which is rather large when considering the 2022 union membership rate for this sample was 11.3% (Hirsch et al.). Not only do the results align with the prediction, but the data also demonstrates the cycle discussed in the prediction.

*Table Displaying Data for Workers With a Bachelor Degree Between 2013-2016*

Year	Membership %	Wage Premium %
2013	12.9%	-7.3%
2014	12.8%	-7.3%
2015	13.0%	-7.0%
2016	12.5%	-8.8%

Between 2013-2014, there is little to no change in the wage premium, and therefore, the membership rate does not change much. In 2015, the wage premium increased by 0.3%, causing an increase in the union membership rate. Finally, in 2016, the wage premium decreased, causing the union membership rate to decrease as well. Although there are a few exceptions to this pattern that can be explained by membership rate being impacted by multiple variables, this relationship is generally true in the entire sample. As opposed to workers who receive both wage and non-wage benefits from labor unions, workers with a bachelor's degree seem to be more incentivized by monetary benefits. As a result, wage premiums seem to impact their decision on which labor markets to enter: union markets versus non-union markets. Given that since the 1970s, wage premiums have been decreasing (Blanchflower and Bryson), it is reasonable to conclude that, at least for workers with at least a bachelor's degree, declining wage premiums have impacted the decreased union popularity.

## *Conclusion*

The goal of this study was to determine which economic factors, if any, influence a decrease in labor union participation. Through the regression model, I was able to find results that were relatively consistent with other literature on the subject. First, by removing the insignificant variable of unemployment from the regression in my past work, it was determined that GDP became slightly more significant and worker productivity became slightly more insignificant. Neither variable changed significantly in terms of overall impact to union popularity, as GDP still has a small, negative impact, while worker productivity has a small, positive effect.

Next, average hourly wage was introduced to the regression, which was isolated after determining the existence of multicollinearity between the independent variables. From this isolated regression, it was determined that average hourly wage had a negative effect on labor union popularity. This may seem counterintuitive, as one might expect increases in hourly wage to be an incentive to increase unionization rates. However, Chen and Islam, as well as Knepper, have shown that union benefits not directly impacting wage are most popular. Chen and Islam discuss the preference for safety, happiness, and work-life balance benefits, while Knepper points to worker compensation as a prioritized benefit. DiNardo and Lee offer a third possibility through their conclusion that employers do not raise wages in response to a risk in a union forming (1428-1429). Therefore, if non-union wages rise, DiNardo and Lee find no reason to believe unionization rates will rise with it. For the other studies of Chen and Islam and Knepper, a rise in union wages could decrease the amount of other benefits workers find more important, and therefore, may not unionize solely on a wage increase.

Lastly, a population of workers was separated between those with and without a bachelor's degree to test the reaction of each group to wage based incentives. Both groups had

an inverse reaction to the impact of union wages on the popularity of unions. Once again, this leads back to the idea that workers enjoy non-wage benefits over direct wage increases in labor unions. When introducing the wage premium to both groups, it was found insignificant to the population of workers without a bachelor's degree, but significant with a positive effect in the group with at least a bachelor's degree. This likely has to do with the work of Blanchflower and Bryson, who note a similar effect occurring with changes to labor supply and labor demand for union and non-union based jobs. It is also important to note that since the 1970's, the wage premium has been decreasing (Blanchflower and Bryson 26), meaning that even though the relationship between union involvement and the wage premium is positive, a historical decrease in wage premiums is causing a decrease in union membership.

There were several shortcomings in the analysis of this paper. For one, there is a lack of information comparing various sectors of the economy, whether that be between the private and public sector, or between two distinct industries, such as finance and education. The lack of this analysis came partly due to complexity of the topic, but also difficulty in finding consistent data to compare two sectors or industries. With an opportunity to continue research on this topic in the future, a comparison of the private and public sector may yield interesting results, as unionization rates are much higher in the public sector (Bureau of Labor Statistics). Therefore, results may differ regarding what variables positively or negatively affect unionization rates between the two sectors.

Another shortcoming of the study has to do with separating the population by education level. In doing this, I failed to provide unseparated data regarding union wage and the wage premium, while also excluding the average hourly wage from the two groups. Although based on the results for the two groups I would not expect much of a difference in an unseparated population for union wage, I would expect interesting results for the wage premium. Given it



was insignificant in the population with less education and significant in the others, it would be interesting to see how it would act when taking a larger, less isolated, population into account.

Third, it could be beneficial to compare unionization rates in different areas of the United States. For example, how popular are unions in rural areas as opposed to urban ones. With vast differences in lifestyle in different areas of the United States, it would be interesting to compare economic indicators that impact union membership in different states, cities, or even counties. Similar to the thought that indicators may vary between sectors, they could also vary between geographical locations. For instance, it would be reasonable to assume that wage based benefits could positively impact union membership in locations with less dangerous jobs. There is a spectrum of locations varying from very little union involvement to extremely high unionization rates, opening up extensive opportunities for further research on the topic with focus on geographical differences.

While looking at all of the variables analyzed, there is a trend that wage based variables have the most impact on union membership. The impact, compared to other variables such as worker productivity, are negative, causing union membership to decline. This opens up an area for further study: an analysis of the impact of different union benefits on union popularity. For example, do non-wage benefits, such as improved job safety, positively impact unionization rates, as discussed by Chen and Islam. Based on the results of this analysis, it seems that although there may be significance between larger economic indicators and union membership, they do not negatively impact the overall unionization rate as much as wage-based benefits.

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