AN ANALYSIS OF US WORK STOPPAGES AND EMPLOYEE WAGES

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1. Introduction

The GitHub repository for this project is located at `https://github.com/NyssaCornelius/FProj`. The Binder link for this project is Binder link.

The data sets are taken from the U.S. Bureau of Labor statistics (`https://www.bls.gov/`). For work stoppages, we used the excel file at `https://www.bls.gov/web/wkstp/monthly-listing.xlsx`. This file contains information on each work stoppage in the US from 1993 on that involved at least 1000 workers. Information about the columns is given in the following table (all columns are stored as text).

column	basic type	description
Organizations involved	nominal	The company or branch of government where the work stoppage occurred.
States	nominal	The states where the work stoppage occurred.
Areas	nominal	The geographic areas where the work stoppage occurred.
Ownership	nominal	This is either private industry (private sector) or state/local government (public sector).
Industry code	numerical	The 2017 NAICS code describing the industry associated to the work stoppage.
Union	nominal	The name of the union associated with the work stoppage.
Union acronym	nominal	The acronym for the union.
Union Local	nominal	A number or word description of the local union associated with the work stoppage.
Bargaining unit	nominal	A description of the bargaining unit for the work stoppage (usually empty).
Work stoppage beginning date	ordinal	Start date of the work stoppage.
Work stoppage ending date	ordinal	End date of the work stoppage.
Number of workers	numerical	The number of workers involved in the work stoppage.
Days idle cumulative for this work stoppage	numerical	The total duration of the work stoppage.
Note	nominal	Any notes about the work stoppage (e.g., the union changed names or the number of workers involved changed during the work stoppage).

Employment statistics at the national level are taken from `https://download.bls.gov/pub/time.series/ce/`, specifically from ce.industry, ce.series, and ce.data.0.AllCESSeries Since a full description of these data sets are given in ce.txt, let us be a bit brief in the description. The file ce.series contains an entry for each type of data stored at the national level (for example: "Average hourly earnings of all employees, stone mining and quarrying, seasonally adjusted"), whereas the actual data values for this are stored in ce.series; they are joined on the column series_id (e.g., CES1021231003). The file ce.series also contains a column for industry_code, which is matched to the description of the industry code in ce.industry. In ce.industry, there is partial information to match an industry code of ce.series with an NAICS industry code of work stoppage data. This is discussed in greater detail in Section 3.

Similarly, employment statistics at the state level are taken from `https://download.bls.gov/pub/time.series/sa/`, specifically sa.series, sa.data.0.Current, sa.industry, and sa.state, with a detailed description of the data sets given in sa.txt. The file sa.series contains an entry for each type of data stored at the state level and the actual data for the entries are stored in sa.data.0.Current, again joining on the column series_id. We use sa.state to decode the state for a series from numeric to string. However, this time sa.industry does contain even partial information to match industry codes, but it does at least give an English description of the codes. This is also discussed in greater detail in Section 3.

[...still need to add explanation for min wage data used in chloropleths ...]

The choice of using these data sets is that they contained the greatest amount of information we could locate. Upon reviewing the literature, they are the standard sets to use (and have been for a long time). To load in the data, we downloaded the text files and then imported them into Pandas dataframes in our jupyter notebook. The question we ask and answer in this project is the following. With the major economic and political changes of the last few decades, do strikes still have a negative correlation with income inequality? Specifically, do strikes correlate with an increase in wages of the associated workers? How do geographical regions affect the frequency of strikes? Does the minimum wage play a role in the frequency of strikes? The inputs for this project are the data sets described above, the outputs are the data visualizations and conclusions that we draw below.

The remainder of this report is as follows. In section 2 we briefly discuss some of the existing literature (both research and non-research articles) on the subject, which will put our project in perspective of the larger picture. In section 3 we go over the data cleaning necessary for our project and the challenges that this presented. In section 4 we both describe how we visualized the data as well as give some of the most relevant visualizations. We conclude this report in section 5, where we make our concluding remarks.

2. Literature Review

Articles discussing work stoppages are almost exclusively about strikes (as shut outs initiated by management are very rare in comparison) and usually focus on union representation of the work force. While this last part is usually true, it is not universally so, as seen in [Rub88] where the author argues that strikes and unions do not go together in terms of correlation with employee wages and wealth inequality. In particular, they make the case that union representation decreases income inequality among specific groups but increases overall inequality, whereas strikes decrease overall income inequality (e.g. union representation may reduce income inequality among low and middle income white families while increasing income inequality between black and white families, whereas strikes reduce income inequality at the aggregate level). That being said, this article is an outlier in this respect and considers data only from 1949 to 1976. In the rest of our analysis, we take the more common approach of grouping unions and strikes together.

We will not spend much time on non-research literature, as for this subject it tends to be very clearly biased. However, we do note that while opinions that are pro-union and pro-strike do sometimes cite relevant statistics, this is far less the case with the opposing side. The latter is largely relegated to opinion pieces in local newspapers and blogs (and so we do not include references to them). While the pro-labor side also appears in similar sources (which we also omit), non-research literature also comes out of think tanks such as Economic Policy Institute and Washington Center for Equitable Growth. These articles are more likely to back up their claims with data and references (although they are often self-citing). For example, in [Bah19] the author makes the case that strikes have and still do empower workers and reduce economic inequality. The article discusses some of the political history surrounding unions and strikes in US, such when unions suffered a serious blow in 1981 when then President Ronald Reagan fired 11,000 air traffic controllers for striking for higher pay and reduced hours; describes summaries of polls on what workers do and do not like about unions and strikes [HF19]; and gives specific examples of recent strikes that have and have not paid off for workers [Yan18]. While not statistical data, the article also describes some of the current anti-union practices of major corporations (see [Har14]). Similarly, while the opinions in [SP20, PMS21] are not always backed by hard data, there the authors do correctly point out trends in the number of strikes and issues with the main source of data for work stoppages. The main source of data for US work stoppages is the U.S. Bureau of Labor Statistics (and this has been the case for over a century) and one issue with the data is that it only includes work stoppages that involve at least 1000 workers. As the authors point out, according to the Bureau of Labor Statistics, nearly 60% of workers in the private sector are employed by companies with fewer than 1000 workers. Additional issues with this data set are regularly brought up in research articles.

There are of course think tanks that are not pro-union, but their arguments avoid statistics of economic inequality and the historical correlation with unions and strikes. One example of this is [Eps20] from the Hoover Institution on War, Revolution, and Peace. Here the author argues against unions with pro-capitalism claims of free trade and competition benefiting the worker. For statistics, the author instead looks to the overall performance of the US economy and unemployment levels [Fit19, Coh19, Has20]. Another approach, as seen in [Wat14] is to examine economic inequality in terms of skilled labor and education of the workforce. However, the authors of [Mis18] make the claim that the data and analysis in [FHKN18] shows that the levels of training and education do not adequately explain include inequality. However, our project is not investigating statistics about these other sources.

In terms of research articles, strikes and unions are studied in many different respects. Lighter on the numbers are studies on public opinion and ethical issues. In [BK70] the authors give a lengthy account of the opinions for and against the legality of strikes in the public sector strikes. Generally speaking, most people at the time of the article accepted that private sector employees should be able to strike, but were divided when it came to the the public sector. Claims against public sector strikes are based on public sector work being essential, that the cost of increasing the collective bargaining power of public sector workers is higher and with lower returns than in the private sector, and that public sector strikes are inappropriate because they may affect public policy. Also there is the dubious claim (which is disputed by the authors [BK70]) that low pay in the public sector, such as for teachers, is due to public opinion on the importance of the service, whereas low pay in the private sector reflects a misallocation of resources. Ultimately the authors take the stance that strikes should be legal for areas of the public sector that would not lead to immediate public danger (e.g., fire fighters should not have the option to strike as part of their collective bargaining). Related to the issue of public sector strikes, [TS06] examines the ethical issue of medical workers being able to strike, which is assumed to be an issue of major importance as doctors move away from autonomous positions to the employee-employer model common to modern health care. Another common topic about the public sector is teacher strikes. By examining one specific case study, the authors of [BW10] draw the unsurprising conclusion that long term teacher strikes have long term (decades long) negative affects on students, but enter the political realm by implying this should be used as a talking point against the legality of teacher strikes. In [HFNR21] the authors examine public opinion polls about teacher strikes and education unions, and make the claim that public opinion is generally pro-labor, with first hand knowledge of the strike greatly increasing this (i.e., parents are more likely to side with their children's teachers than to blame the teachers for the strike).

Taking statistics in mind, there are a large number of articles attempting to study and model the occurrence of strikes [Ken86, Ken85, Mau82, Nap87], usually based on strikes appearing in waves over time. While present in articles over a century old [Cro08], there has been an increased interest in how relevant the recorded data actually is and how appropriately it is being analyzed. For example, in [PP74] it is pointed out that the data from the Bureau of Labor statistics records the the number of days of the work stoppage and the number of people involved, but this does not properly measure the actual cost of the strike. The authors attempt to correct this by examining the work force involved in each strike and weighting the strike with a cost associated to the particular type of work. Related to the issue of actual economic cost, the authors of [McH91] attempt to measure the impact of a strike based not just on the individual firm, but also on the cost to associated businesses. The authors of [SB87] suggest that the the variance in strikes is better explained by the cost of losing a job than the unemployment rate, which is commonly used. For the modern era, it is suggested in [MD10] that unions should be studied separately for institutionalized unions and social movement unions, whereas the authors of [KT89] think that the old models and explanations are no longer relevant to due to changes in business practices and public policy stemming from technology and globalization. There is also the claim, as seen in [WLR99], that strikes and unions are now irrelevant to income inequality.

The point to take from this is that historically it has been widely accepted that union representation and strikes correlate with improved conditions for the labor force. It is also accepted that in recent decades, union representation and the number of strikes have significantly declined. This is attributed to the change in power held by companies due to technology, globalization, and political power. In 2018 and 2019 there was a sudden and major uptick in strikes, but like most things this slowed in 2020 due to covid-19. Our research is to verify that despite this loss in power of the labor force, strikes do indeed still correlate with positive gains, as this should be verified and not be taken for granted. [...To be changed, if our data doesn't show that...]

3. Data Cleaning

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4. Visualizations

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5. Conclusions

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References

[Bah19] Bahn, Kate: *The once and future role of strikes in ensuring U.S. worker power*. https://equitablegrowth.org/the-once-and-future-role-of-strikes-in-ensuring-u-s-worker-power/. Version: 2019

[BK70] Burton, John F. ; Krider, Charles: The role and consequences of strikes by public employees. In: *The Yale Law Journal* 79 (1970), Nr. 3, S. 418–440

[BW10] Belot, Michèle ; Webbink, Dinand: Do teacher strikes harm educational attainment of students? In: *Labour* 24 (2010), Nr. 4, S. 391–406

[Coh19] Cohn, Kevin Gary D.and H. Gary D.and Hassett: *Tax Reform Has Delivered for Workers*. https://www.wsj.com/articles/tax-reform-has-delivered-for-workers-11577045463. Version: 2019

[Cro08] Cross, Ira: Strike Statistics. In: *Publications of the American Statistical Association* 11 (1908), Nr. 82, 168–194. http://www.jstor.org/stable/2276104. – ISSN 15225437

[Eps20] Epstein, Richard: *The Decline Of Unions Is Good News*. https://www.hoover.org/research/decline-unions-good-news. Version: 2020

[FHKN18] Farber, Henry S. ; Herbst, Daniel ; Kuziemko, Ilyana ; Naidu, Suresh: Unions and inequality over the twentieth century: New evidence from survey data / National Bureau of Economic Research. 2018. – Forschungsbericht

[Fit19] Fitzgerald, Maggie: *Black and Hispanic unemployment is at a record low.* https://www.cnbc.com/2019/10/04/black-and-hispanic-unemployment-is-at-a-record-low.html. Version: 2019

[Har14] Harris, Jessica: *The once and future role of strikes in ensuring U.S. worker power.* https://onlabor.org/captive-audience-meetings-a-backgrounder/. Version: 2014

[Has20] Haskins, Justin: *Trump's big reelection weapon: A remarkable manufacturing jobs boom.* https://thehill.com/opinion/campaign/479579-trumps-big-reelection-weapon-a-remarkable-manufacturing-jobs-boom. Version: 2020

[HF19] Hertel-Ferdandez, Alexander: *What kind of labor organizations do U.S. workers want?* https://equitablegrowth.org/what-kind-of-labor-organizations-do-u-s-workers-want/. Version: 2019

[HFNR21] Hertel-Fernandez, Alexander ; Naidu, Suresh ; Reich, Adam: Schooled by Strikes? The Effects of Large-Scale Labor Unrest on Mass Attitudes toward the Labor Movement. In: *Perspectives on Politics* 19 (2021), Nr. 1, S. 73–91. http://dx.doi.org/10.1017/S1537592720001279. – DOI 10.1017/S1537592720001279

[Ken85] Kennan, John: The duration of contract strikes in U.S. manufacturing. In: *Journal of Econometrics* 28 (1985), Nr. 1, 5-28. http://dx.doi.org/https://doi.org/10.1016/0304-4076(85)90064-8. – DOI https://doi.org/10.1016/0304–4076(85)90064–8. – ISSN 0304–4076

[Ken86] Kennan, John: The economics of strikes. In: *Handbook of labor economics* 2 (1986), S. 1091–1137

[KT89] Keeran, Roger ; Tarpinian, Greg: Public Policy and the Recent Decline in Strikes. In: *Policy Studies Journal* 18 (1989), Nr. 2, S. 461

[Mau82] Mauro, Martin J.: Strikes as a result of imperfect information. In: *ILR Review* 35 (1982), Nr. 4, S. 522–538

[McH91] McHugh, Richard: Productivity effects of strikes in struck and nonstruck industries. In: *ILR Review* 44 (1991), Nr. 4, S. 722–732

[MD10] Martin, Andrew W. ; Dixon, Marc: Changing to win? Threat, resistance, and the role of unions in strikes, 1984–2002. In: *American Journal of Sociology* 116 (2010), Nr. 1, S. 93–129

[Mis18] *Examining the links between rising wage inequality and the decline of unions.* https://equitablegrowth.org/examining-the-links-between-rising-wage-inequality-and-the-decline-of-unions/. Version: 2018

[Nap87] Naples, Michele I.: An analysis of defensive strikes. In: *Industrial Relations: A Journal of Economy and Society* 26 (1987), Nr. 1, S. 96–105

[PMS21] Poydock, Margaret ; McNicholas, Celine ; Shierholz, Heidi: *Downturn in strike activity reflects COVID-19 recession but fails to capture many walkouts for worker safety.* https://www.epi.org/publication/2020-work-stoppage-report/. Version: 2021

[PP74] Palomba, Neil A. ; Palomba, Catherine A.: The economic costs of strikes: a suggested measure. In: *Review of Financial Economics* 10 (1974), Nr. 1, S. 12

[Rub88] Rubin, Beth A.: Inequality in the working class: The unanticipated consequences of union organization and strikes. In: *ILR Review* 41 (1988), Nr. 4, S. 553–566

[SB87] Schor, Juliet B. ; Bowles, Samuel: Employment Rents and the Incidence of Strikes. In: *The Review of Economics and Statistics* 69 (1987), Nr. 4, 584–592. http://www.jstor.org/stable/1935952. – ISSN 00346535, 15309142

[SP20] Shierholz, Heidi ; Poydock, Margaret: *Continued surge in strike activity signals worker dissatisfaction with wage growth.* https://www.epi.org/publication/continued-surge-in-strike-activity/. Version: 2020

[TS06] Thompson, Stephen L. ; Salmon, J W.: Strikes by physicians: a historical perspective toward an ethical evaluation. In: *International Journal of Health Services* 36 (2006), Nr. 2, S. 331–354

[Wat14] Watson, William: *If American wages are determined by skills, it's hard to see how inequality in wages is unfair.* https://financialpost.com/opinion/william-watson-if-american-wages-are-determined-by-skills-its-hard-to-see-how-inequality-in-wages-is-unfair?r. Version: 2014

[WLR99] Wallace, Michael ; Leicht, Kevin T. ; Raffalovich, Lawrence E.: Unions, Strikes, and Labor's Share of Income: A Quarterly Analysis of the United States, 1949–1992. In: *Social Science Research* 28 (1999), Nr. 3, 265-288. http://dx.doi.org/https://doi.org/10.1006/ssre.1999.0647. – DOI https://doi.org/10.1006/ssre.1999.0647. – ISSN 0049–089X

[Yan18] Yan, Holly: *What kind of labor organizations do U.S. workers want?* https://www.cnn.com/2018/05/29/us/what-teachers-won-and-lost/index.html. Version: 2018

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