Changes in U.S. Job Satisfaction:

Impacts of Technology, Work Environment, and Covid-19

Nayan J. Jani

University of Massachusetts Amherst

DACSS 790Q: Advanced Quantitative Methods

Carey Stapleton

12/14/23

Abstract

The working world in the past couple of years has changed rapidly due to the covid-19 pandemic, where we have seen an increase in the amount of people working from home and the use of technology in the workplace. The goal of this study is to investigate the influences of the use of technology in the workplace, working from home, and the Covid-19 pandemic on job satisfaction. Data analysis was conducted in R using two ordered logit models: one main effect model and one interaction model. The data sample (n=3,133) comes from the 2018 (n= 1,391) and 2022 (n = 1,742) versions of the General Social Survey (GSS). The sample represents the adult working public in the United States. The results reveal that workers who mainly work from home are significantly more likely ($p < 0.05$) to be satisfied with their jobs than survey respondents who never work from home and workers who use technology more than 75% of their total work time per week are significantly less likely ($p <0.05$) to be satisfied with their jobs than those who use technology less than 25% of their total work time per week. There was no significant evidence that suggested the moderating effect of pre and post covid had any impact on job satisfaction. Additionally, survey respondents who are paid by a temporary agency or regular, permanent employees are significantly less likely ($p < 0.05$) to be satisfied with their jobs than those who are independent contractors.

Changes in U.S. Job Satisfaction: Impacts of Technology, Work Environment, and Covid-19

The working world in the United States has drastically changed in the last couple of years. More specifically, there have been many changes in the work environment and the amount of technology being used in the workplace. In the world today, there is a good percentage of people that are working from home full time. In 2023, 35% of workers with jobs that can be done remotely are working from home all of the time (Parker, 2023). In addition, the shift to using new technology in the workplace has increased over the years. The working public must know how to navigate video call applications, leverage Generative AI, and use presentation tools such as Tableau or PowerBI. With these vital changes in the workplace, the attitudes and behaviors towards one's occupation may have altered. The Covid-19 pandemic may also play a role in changes in one's job satisfaction as working from home and using technology in the workplace became a more common practice. This study will help to understand how working from home, technology use, and Covid-19 relate to job satisfaction. The findings from this paper can provide insights into how the working public in the United States are more or less satisfied with their jobs based on the amount of technology they use in the workplace and the amount they work from home. This study will also investigate the moderating effect of pre and post covid between job satisfaction, amount of technology used, and amount of time worked from home. The research questions are as follows:

- ***Why are people more satisfied with their jobs than others?***
- ***Why are some people less satisfied with their jobs than others?***
- ***How has job satisfaction changed after the Covid-19 pandemic?***

This paper will first describe and discuss the research questions and hypotheses through literature review, followed by a detailed description of the research design and results. The paper will conclude with a summary of the study and some final thoughts.

Literature Review

Job Satisfaction

Job satisfaction can be defined as an emotional state resulting from one's job experiences. It is important to evaluate job satisfaction as it has an impact on job performance and the quality of one's life (Montuori et al., 2022).

Work Environment

There have been many studies that reveal the impacts of work environment on job satisfaction. Previous literature on the impact of Covid-19 on job satisfaction for nurses in Europe has suggested that their work conditions and number of staff available negatively affected their job satisfaction (Makowicz et al., 2022). Another study that investigated what impacts job satisfaction of 8th grade science teachers in the United states revealed that their work environment significantly impacted their job satisfaction (Ker, H.-W. et al., 2022). Although the work environments from these studies are vastly different, the similarities of their findings do suggest that work environment could be one of the factors that affect job satisfaction. In this study, the work environment will be defined as how often someone works from home. The goal is to capture the difference in job satisfaction between people in the working public in the United States that work from home at different frequencies.

Technology

Technology can be described as any digital tool used in the workplace. This can include computers, tablets, smart phones, cash registers, scanners, GPS devices and robotic devices.

From previous literature, there has been evidence that suggests the increased use of technology has negatively impacted job satisfaction in certain cases. One study investigated the impact of the increased usage of digital communication tools on job satisfaction for the working public in Luxembourg by comparing the usage of technology before and after the first lockdown in Spring 2020. The study found that individuals who increased their usage of digital communication tools and used them on a daily basis had a decrease in job satisfaction during the pandemic. The researchers believe this may have happened because of the increased amount of information to deal with from these digital tools (Martin, L. et al, 2022). Again, The goal is to capture the difference in job satisfaction between people in the working public in the United States that use technology at work at different frequencies.

Covid-19

There is evidence from previous studies that imply that the Covid-19 pandemic has influenced individuals job satisfaction. One research study that discusses the perceived threat of covid-19, job stress, and the ability to adapt to a crisis on job satisfaction for Hotel workers in Taiwan revealed that the perceived threat of Covid-19 is associated with a decrease in job satisfaction (Cheng et al., 2022).

Hypotheses

- *#1: People who work mainly from home are more satisfied with their job than those who never work from home.*
- *#2: Working from home became more influential at making people more satisfied with their job post covid than pre covid.*
- *#3: In 2022, the working population is more satisfied with their jobs than they were in 2018.*

- *#4: People who are using technology for more than 75% of their total work time during a week are less satisfied with their jobs than others.*
- *#5: In post COVID times, using technology is related to lower job satisfaction than pre-COVID.*

Research Design

Data

The data being used in this study comes from the General Social Survey (GSS). The survey is conducted by the National Opinion Research Center (NORC) at the University of Chicago and sponsored by the National Science Foundation (NSF). The data (n = 3,113) is sampled from the years 2018 (n= 1,391) and 2022 (n = 1,742). The GSS is designed to uncover trends, attitudes and behaviors in American society and allows researchers to understand the function of society. The sample includes all adult respondents that participated in the GSS that are a part of the working public in the United States.

Dependent Variable

The dependent variable in this study is Job Satisfaction. It is an ordinal variable with 4 levels (1=Not at all satisfied, 2=Not too satisfied, 3=Somewhat satisfied, 4=Very satisfied). An ordered logit model with survey weights from the respective sampling years was used to model job satisfaction. The model was constructed in R using the polr() function from the 'MASS' package. The weights used in this model are as follows:

- WTSS (2018 sample), WTSSPS (2022 sample) - "Adjusts for both sub-sampling of nonrespondents (via an area non-response adjustment) and number of adults in the household" (Davern et al., 2023).

Independent Variables

Working from home: Working from home (WFH) was evaluated by how often the respondent works from home as a part of their job. The variable is ordinal 6 levels (1= Never, 2= A few times a year, 3 = About once a month, 4 = About once a week, 5 = More than once a week, 6 = Worker works mainly at home). A low value of 'working from home' corresponds to never working from home whereas a high value corresponds to mainly working from home. This variable was coded as a factor in the model.

Percentage of technology used: Percentage of technology used was evaluated by the respondent's percentage of their total time at work using different types of electronic technologies during a typical work week. The variable is ordinal with 4 levels (1=Used tech between 0-25% of your total time at work, 2= Used tech between 26-50% of your total time at work, 3= Used tech between 51-75% of your total time at work, 4= Used tech more than 75% of your total time at work). A low value for 'Percentage of technology used' corresponds to using technology less than or equal to 25% of the total time at work in a typical week whereas a high value corresponds to using technology more than 75% of the total time at work in a typical week. This variable was coded as a factor in the model.

Post covid: To evaluate the moderating effect of pre and post covid, the year of the survey response for each survey participant was coded into a dichotomous variable (0 = 2018, 1=2022). The model used to evaluate these relationships is the same one as described above but with interaction effects between 'post covid', 'Percentage of technology used', and 'working from home'. The importance of choosing this approach is to investigate if the move to more work from home and more use of technology post-COVID actually lead to any significant changes in job satisfaction.

Control Variables

Demographic variables: The demographic control variables included in this analysis are degree (level of education), age group, Person of Color, Female or not (gender),. Degree is grouped into five levels (1 =Less than high school, 2= High school, 3= Associate/junior college, 4= Bachelor's, 5= Graduate) and age group is grouped into five levels (1= age 18-30 , 2= age 31-40, 3= age 41-50, 4 = age 51-65, 5= age 65+). Person of color and Female or not are coded as dichotomous variables. These control variables are included in both models as it is a common practice in the social science world to add these when dealing with observational survey analysis. All variables are coded as type numeric in both models.

Work arrangement at main job: Work arrangement at main job is a categorical variable that describes the type of job the respondent has (1 = Independent contractor/consultant/freelance worker, 2= On-call work only when called to work, 3= Paid by a temporary agency, 4= Work for contractor who provides workers/services, 5= Regular permanent employee). Adding this variable to the models will help control for how different types of job arrangements affect one's job satisfaction.

Years at current job: Years at current job is an ordinal variable coded as numeric (1 =0-1 years, 2=2-4 years, 3 = >4 years). It was important to include this variable as there has been evidence from previous research that suggests that the amount of time spent at one job has an affect on job satisfaction. A study that investigated the impact of length of service (years worked at job) on job satisfaction for automotive engineers in Pakistan was able to find evidence that reveals a non linear relationship between the two variables. The study found that job satisfaction decreases for each year in the early years of service but begins to rise as employees continue to work for many

years (Sarwar et al., 2013). The findings from this study imply that controlling for years worked at a current job is necessary when modeling for job satisfaction.

Modeling and Results

As mentioned above, this study will conduct two ordered logit regression models in R using the polr() function from the 'MASS' package: one without an interaction effect and one with the interaction effect of Covid-19. The results of each model will be displayed side by side in a table using the msummary() function. All coefficients of the significant ($p < 0.05$) primary independent variables will be converted into predicted probabilities with a 95% confidence interval using ggpredict() and graphed using ggplot() in order to make the magnitude and direction of the IV's more easily interpretable.

Results

Models Results

Below is the ordered logit model results for both the main effect model and interaction model.

Table 1: Ordered logit model results for both the main effect model and interaction model.

	Main Effect	Interaction
1|2	−4.080***	−4.031***
	(0.201)	(0.212)
2|3	−2.694***	−2.645***
	(0.177)	(0.190)
3|4	−0.291+	−0.239
	(0.169)	(0.183)
Uses tech 26-50% per week	−0.169	−0.235
	(0.105)	(0.156)

Uses tech 51-75% per week	0.035	0.062
	(0.127)	(0.186)
Uses tech >75% per week	−0.350***	−0.241+
	(0.091)	(0.131)
WFH few times a year	0.158	0.167
	(0.146)	(0.213)
WFH about once a month	0.584***	0.470*
	(0.167)	(0.222)
WFH about once a week	0.297*	0.464*
	(0.139)	(0.192)
WFH more than once a week	0.291*	0.403*
	(0.114)	(0.175)
Mainly WFH	0.390**	0.328
	(0.123)	(0.230)
2022	−0.050	0.035
	(0.070)	(0.131)
Female	−0.029	−0.027
	(0.070)	(0.070)
POC	−0.144+	−0.145+
	(0.079)	(0.079)

Age group	0.223***	0.225***
	(0.032)	(0.032)
On-call, work only when called to work	−0.191	−0.188
	(0.243)	(0.244)
Paid by a temporary agency	−1.618***	−1.628***
	(0.364)	(0.365)
Work for contractor who provides workers/services	−0.343	−0.347
	(0.221)	(0.222)
Regular, permanent employee	−0.533***	−0.529***
	(0.112)	(0.113)
Years worked at current job	−0.094*	−0.098*
	(0.044)	(0.044)
Education Level	−0.052+	−0.053+
	(0.032)	(0.032)
Uses tech 26-50% per week:2022		0.124
		(0.209)
Uses tech 51-75% per week:2022		−0.027
		(0.250)
Uses tech >75% per week:2022		−0.191
		(0.175)

WFH few times a year:2022	−0.027
	(0.289)
WFH about once a month:2022	0.224
	(0.333)
WFH about once a week:2022	−0.353
	(0.272)
WFH more than once a week:2022	−0.167
	(0.225)
Mainly WFH:2022	0.109
	(0.266)
Num.Obs.	3268
AIC	6323.9
BIC	6451.8
RMSE	3.20

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Main effect model: Based on the model results, there is evidence that supports Hypothesis #1. Survey respondents who WFH about once a month (0.584 log odds) , WFH about once a week (0.297 log odds), WFH more than once a week (0.291 log odds), and Mainly WFH (0.390 log odds) are all significantly more likely ($p < 0.05$) to be satisfied with their jobs than survey respondents who never WFH. Additionally, there is evidence from the model results that supports Hypothesis #4. Survey respondents who use technology more than 75% of their total work time per week (−0.350 log odds) are significantly less likely ($p < 0.05$) to be satisfied with their jobs than those who use technology less than 25% of their total work time per week. Hypothesis #3 is not supported based on the model results as '2022' is not statistically different

from 0 (−0.050 log odds , 0.70 SE). Interestingly, survey respondents who are paid by a temporary agency (−0.533 log odds) or regular, permanent employees (−1.618 log odds) are significantly less likely to be satisfied with their jobs than those who are Independent contractors. Other control variables that are statistically different from 0 at $p < 0.05$ include age group and Years worked at current job.

Interaction model: Unfortunately, there is insufficient evidence that supports Hypotheses #2 and #5 as none of the interactions between working from home, the % of time using technology in a work week, and year (pre and post covid) are statistically different from 0 at $p < 0.05$.

Model fit: 'Percentage of technology used' and 'working from home' were coded as factors as their true relationship between both of these variables and job satisfaction is not linear. Coding these variables as factors will remove any bias of a linear relationship between the IV's and the DV. The main effect model has a slightly better fit than the interaction model. The AIC and BIC values for the main effect model (AIC: 6323.9, BIC: 6451.8) are a bit lower than the interaction model (AIC: 6334.1, BIC: 6510.8) , which implies that it is a better fit.

Predicted Probabilities

Below are graphs that display the predicted probabilities of job satisfaction for all the significant primary independent variables and the control variable 'work arrangement at main job'.

Figure 1: Predicted probabilities of the reference and significant levels of % of tech used per week during work

Figure 1 shows that survey respondents who use technology more than 75% of their total work time per week have a lower predicted probability of being very satisfied with their job (~55% probability of being very satisfied) than those who use technology less than 25% of their total work time per week (~ 62% probability of being very satisfied). The reason for this could be similar to the conclusion found in the literature review about technology: the increased amount of information workers have to deal with due to using more technology is much harder to handle than workers who do not use as much technology in the workplace.

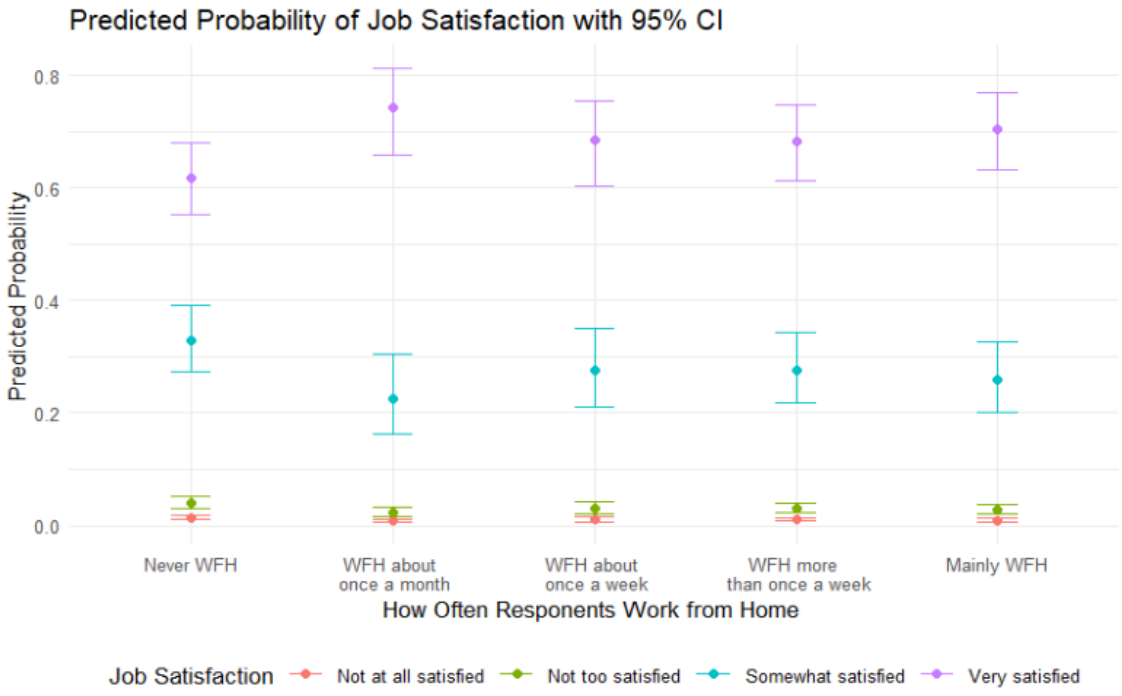

Figure 2: Predicted probabilities of the reference and significant levels of how often respondents work from home

Figure 2 shows that the survey respondents who never WFH have a lower predicted probability of being very satisfied with their job (~ 60% probability of being very satisfied) than those who mainly WFH (~70% probability of being very satisfied). The reason for why this is

the case could be that workers feel more comfortable in an at home work environment and favor the flexibility of working from home over working in person.

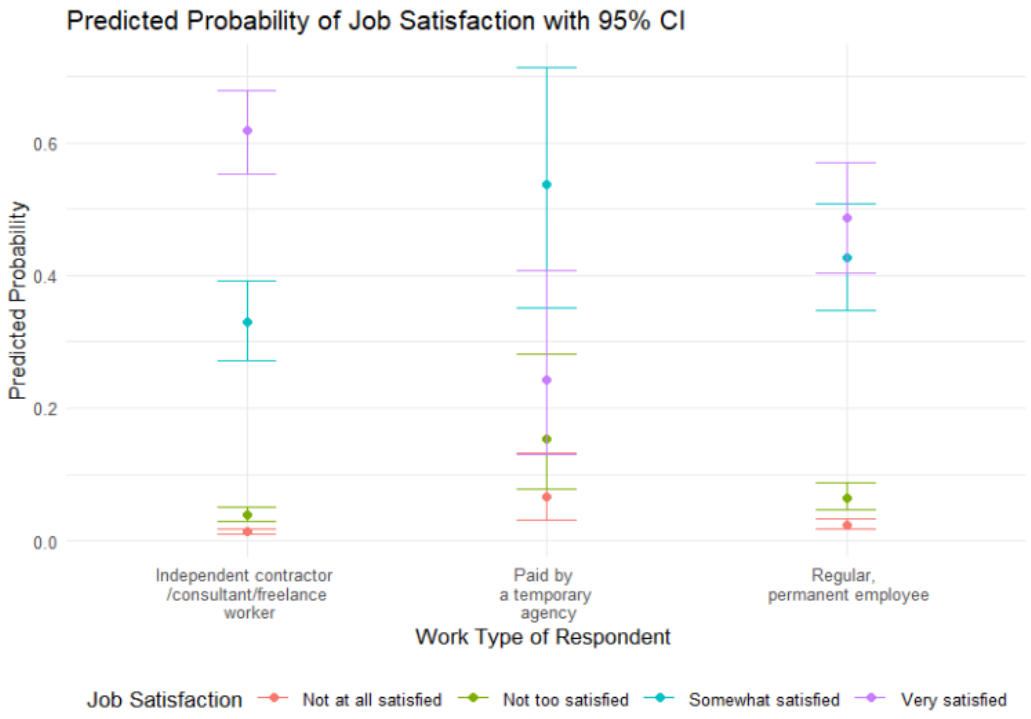

Figure 3: Predicted probabilities of the reference and significant levels of work type of respondent

Figure 3 shows the survey respondents who are Independent contractor/consultant/ freelance workers have a much higher predicted probability of being very satisfied with their job (~62% probability of being very satisfied) than survey respondents who are Paid by a temporary agency (~25% probability of being very satisfied) and regular, permanent employees (~ 50% probability of being very satisfied). The reason Independent contractor/consultant/ freelance workers have a greater chance of being very satisfied with jobs could be because of how flexible their jobs are. Although their job security may not be as safe as other types of work arrangements, Independent contractor/consultant/ freelance workers are tasked with work that

they excel and are interested in, which leads towards the belief that they are more satisfied with their jobs than the other significant work arrangements.

Conclusion

In this paper, the goal was to investigate how the working public in the United States is more or less satisfied with their jobs based on the amount of technology they use in the workplace and the amount they work from home and the moderating effect of pre and post covid between job satisfaction, amount of technology used, and amount of time worked from home. The two models used in this study were both ordered logit models with weights: one without an interaction effect and one with an interaction effect with pre and post covid. The interaction model was selected because it can evaluate if the move to more work from home and more use of technology post-COVID actually lead to any significant changes in job satisfaction. This study was able to find evidence that supports Hypothesis #1: "*People who work mainly from home are more satisfied with their job than those who never work from home"* and Hypothesis #4: "*People who are using technology for more than 75% of their total work time during a week are less satisfied with their jobs than others"*. The major findings from this study are as follows:

- People who use tech more than 75% of their time during a work week are significantly less likely to be very satisfied with their job than those who use tech less than 25% of their time during a work week, with all variables held constant.
- People who never work from home are significantly less likely to be very satisfied with their job than people who mainly WFH, with all variables held constant.
- Independent contract workers have the highest predicted probability of being very satisfied with their job compared to workers paid by a temporary agency and regular, permanent employees.

Overall, this project serves as a good start in understanding how job satisfaction is impacted by different work environments and the use of technology, though there are many variables that have an impact on job satisfaction that were not investigated in this study. One variable that I wish I could have included is job type. It would've been interesting to see the difference in job satisfaction for different types of occupations. Also, job type would serve as an important control variable as there is a wide array of occupations in the world that require different levels of skill and responsibility.

I learned a ton about the importance of understanding job satisfaction not only in America, but across the world. The topic is constantly studied throughout the years and researchers investigate many different factors that could affect job satisfaction. Hopefully further research on variables that impact job satisfaction can lead to solutions that can help people who work be as happy as they can at their occupations. This project also made me understand when to apply an ordered model, how to apply it, when to apply interaction effects, and how to interpret the results for both types of models.

References

Cheng, S.-C., & Kao, Y.-H. (2022). The impact of the COVID-19 pandemic on job satisfaction: A mediated moderation model using job stress and organizational resilience in the hotel industry of Taiwan. *Heliyon*, 8(3), e09134. https://doi.org/10.1016/j.heliyon.2022.e09134

Davern, M., Bautista, R., Freese, J., Herd, P., & Morgan, S. L. (2023). *General Social Survey 1972-2022* [Machine-readable data file]. Principal Investigator, Michael Davern; Co-Principal Investigators, Rene Bautista, Jeremy Freese, Pamela Herd, and Stephen L. Morgan. NORC ed. Chicago. 1 datafile (Release 2) and 1 codebook (2022 Release 2).

Dawid Makowicz, Katarzyna Lisowicz, Krzysztof Bryniarski, Renata Dziubaszewska, Natalia Makowicz, & Beata Dobrowolska. (2022). The impact of the COVID-19 pandemic on job satisfaction among professionally active nurses in five European countries. *Frontiers in Public Health*, 10. https://doi.org/10.3389/fpubh.2022.1006049

Ker, H.-W., Lee, Y.-H., & Ho, S.-M. (2022). The Impact of Work Environment and Teacher Attributes on Teacher Job Satisfaction. *Educational Process: International Journal*, *11*(1), 28–39.

Martin, L., Hauret, L., & Fuhrer, C. (2022). Digitally transformed home office impacts on job satisfaction, job stress and job productivity. COVID-19 findings. *PLoS ONE, 17*(3), 1–23. https://doi.org/10.1371/journal.pone.0265131

Montuori, P., Sorrentino, M., Sarnacchiaro, P., Di Duca, F., Nardo, A., Ferrante, B., D'Angelo, D., Di Sarno, S., Pennino, F., Masucci, A., Triassi, M., & Nardone, A. (2022). Job Satisfaction: Knowledge, Attitudes, and Practices Analysis in a Well-Educated Population. *International Journal of Environmental Research and Public Health*, 19(21), 14214. https://doi.org/10.3390/ijerph192114214

Parker, K. (2023, March 30). About a third of U.S. workers who can work from home do so all the time. *Pew Research Center.*

Sarwar, S., Mirza, E., Ehsan, N., Khan, K., & Hanif, H. (2013). Determining the impact of age and LOS on job satisfaction: a case study of Pakistan automotive industry. I*nternational Journal of Human Resource Management*, 24(2), 415–435. https://doi.org/10.1080/09585192.2012.674960