Federal State Autonomous Educational Institution for Higher Education
«NATIONAL RESEARCH UNIVERSITY
«HIGHER SCHOOL OF ECONOMICS»

Faculty «Saint Petersburg School of Economic and Management»
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Impact of COVID-19 on the Job Satisfaction of Russian Employees

Bachelor's thesis format: Article

EDUCATIONAL PROGRAMME
«International Business and Management Studies»

Student's group number № BMN198

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Saint Petersburg
2023

Abstract

This study aimed to estimate the effect of COVID-19 pandemic on job satisfaction across low, moderate, and high COVID-19 risk groups within the Russian workforce, focusing on satisfaction with job in general, working conditions, growth opportunities, and pay. This study utilized Heckman probit model using secondary data obtained from the "Russia Longitudinal Monitoring Survey, RLMS-HSE" for the years 2019-2020, collected by annual nationwide representative survey using probability stratified multistage area sampling. We found that not all aspects of job satisfaction were impacted by COVDI-19. Results showed a decline in satisfaction with working conditions among high COVID-19 risk workers, while satisfaction in this aspect increased in the moderate risk group. Low-risk workers displayed higher job satisfaction in general, with growth opportunities, while moderate-risk workers showed higher satisfaction with pay. These findings suggest that the pandemic has exacerbated disparities in job satisfaction, with the most adverse effects being felt by high-risk and vulnerable workers. This study contributes to the literature by examining the differential impact of the COVID-19 pandemic on job satisfaction across various risk groups in the Russian context and interpreting the results based on Job Demands-Resources Model. Limitations include a relatively small sample size for the high-risk group and lack of extensive data on vulnerable professions. Future research could expand the sample size, incorporate more years of data, and explore monthly trends to provide a more comprehensive understanding of the effect of COVID-19 on job satisfaction.

Keywords: job satisfaction, employee well-being, COVID-19, JD-R model, Russian workforce

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1 Introduction

Research Background and Motivation

Job satisfaction has long been acknowledged as a critical factor in the well-being of employees (Dong & Yan, 2022), which in turn, plays a vital role in the survival and development of organizations (Spreitzer & Porath, 2012). In addition, previous research has demonstrated that job satisfaction mediates the relationship between the working environment and turnover intent (Lambert et al., 2001) and is positively associated with job performance and work output (Shobe, 2018).

The COVID-19 pandemic has led to unprecedented changes in the global workforce, prompting both mini and micro-shifts in work perceptions and occupations (Kramer & Kramer, 2020). This unique context has generated newfound interest in understanding the impact of the pandemic on job satisfaction. While some studies have shown a positive effect on job satisfaction for certain groups, such as remote workers who experienced reduced commuting time and a less stressful working environment (Aksoy et al., 2022; Gajendran & Harrison, 2007; Laß & Wooden, 2023), others have highlighted adverse effects on job satisfaction for frontline workers and those at increased risk of infection. This includes healthcare workers (HCWs) who reported higher levels of strain, stress (Lilja et al., 2022), and burnout (Morgantini et al., 2020), as well as vulnerable workers facing increased risk of income loss due to reduced work hours or job loss (OECD, 2022). In addition, the risk of burnout was found to be high across all key workers (Jooshandeh & Grimond, 2020).

Despite the growing body of literature on this subject, there remains a research gap in understanding the impact of COVID-19 on job satisfaction within emerging economies, such as Russia. Most existing studies, including those by Toscano et al. (2022), have primarily focused on remote employees' job satisfaction, leaving the pandemic's broader implications on the Russian workforce largely unexplored. Furthermore, the unique context of the Russian labor market, with its distinct social, economic, and cultural factors, warrants a separate examination of this issue.

Hence, our research problem is the following: COVID-19 had a negative effect on the working conditions and increased job demands for vulnerable to COVID-19 working groups; therefore, changes in job satisfaction may not be similar for low, moderate, and high COVID-19 risk professions.

The relevance of the research problem to the specified context

The relevance of the research problem, which examines the potential differences in levels of job satisfaction between low, moderate, and high COVID-19 risk working groups, is in its ability to provide important insights into the challenges faced by various professions among Russian employees. Using the understanding of those differences, organizations and policymakers can develop targeted policies to support employees during crises, improve working conditions, promote employee well-being, and, therefore, improve the organization's performance. Also, this research contributes to a research gap in the literature on job satisfaction within the context of the COVID-19 pandemic in emerging economies like Russia, contributing valuable knowledge that can develop policy interventions to support workers in the post-pandemic era.

Our research question grounded in the specific research context is the following: Within the context of the Russian workforce, how did the COVID-19 pandemic impact job satisfaction differently for workers at higher risk of infection than those at lower risk?

To address the research question, the study will utilize secondary data analysis "Russia Longitudinal Monitoring Survey, RLMS-HSE," collected through annual nationally representative surveys (questionnaires) from 2019 to 2020 (National Research University "Higher School of Economics" et al., 2019, 2020). The research will employ the Heckman probit model.

The proposed managerial application

By exploring the differences in various aspects of job satisfaction between vulnerable and non-vulnerable workers during the COVID-19 pandemic within the Russian workforce, this research emphasizes the necessity of implementing customized approaches to support the well-being of employees across various professions (Dong & Yan, 2022; Spreitzer & Porath, 2012). The study's results can help companies and policymakers develop targeted strategies, such as improving working conditions and providing additional resources, to effectively mitigate the negative effects of crises like COVID-19 on job satisfaction.

Proposed scientific contribution

This study is positioned within the research streams that investigate job satisfaction, particularly focusing on the impact of external factors such as the COVID-19 pandemic on employee job satisfaction. Extant research on this topic has primarily explored the job satisfaction of remote employees (Toscano et al., 2022) or HCWs (Ibrahim et al., 2022) and has mainly been conducted in developed economies (Lilja et al., 2022; Morgantini et al., 2020).

This research advances knowledge on the topic by utilizing Heckman probit model to examine the effects of the COVID-19 pandemic on job satisfaction among high, moderate, and low COVID-19 risk workers within the Russian workforce, expanding the scope beyond remote employees and healthcare workers, which are typically studied in the current literature. The Heckman probit model aims to isolate the effect of COVID-19 while accounting for control variables and potential sample selection bias related to a respondent's active working status.

In addition, by using various measurements of job satisfaction, such as general job satisfaction, working conditions, growth opportunities, and pay satisfaction, the study provides a more comprehensive analysis of the effect of COVID-19 on different aspects of the job satisfaction of employees.

The subsequent sections of this thesis will be organized as follows: Section 2 will provide a literature review on job satisfaction, employee well-being, and the impact of the COVID-19 pandemic on the workforce as well as hypotheses development; Section 3 will present the research methodology, data and procedures description; Section 4 will describe the findings of the research; and Section 5 will present the discussion of the findings; Section 6 will present conclusions.

2 Literature review

This literature review section starts with exploring concepts of employee well-being, subjective well-being, and job satisfaction. After that, it describes job satisfaction as the component of subjective well-being (SWB). Then, the focus is shifted to findings of prior research on the effect of the COVID-19 pandemic on high, moderate and low COVID-19 risk employees. After that, the Job Demands-Resources (JD-R) model will be introduced, and hypotheses will be developed.

2.1 Subjective well-being (SWB) and job satisfaction

Employee well-being is an important research topic in organizational behavior and related areas. According to Spreitzer & Porath, 2012, the well-being of employees is crucial for the organization's survival and development. Thus, it can be beneficial to investigate the relationship between employee well-being and other factors. One may argue that the literature exploring these relationships is rather extensive. For example, several studies confirmed the link between well-being and productivity. The research by Donald et al., 2005 was based on 16,000 employees in the UK occupied in different industries, public and private sector, and concluded that "higher employee productivity was associated with better psychological well-being." Notably, the research authors claimed that results can be generalized to other employee groups. Similarly, Robertson & Cooper, 2011 investigated the relationship between psychological well-being and job performance and productivity and obtained similar results. Other studies emphasized that high levels of employee well-being are connected to employee engagement (Bakker et al.,2014), job satisfaction (Judge et al., 2001), and optimal job performance (Bakker & Oerlemans, 2011).

Diener (1984) proposed the concept of subjective well-being (SWB), which includes life satisfaction (LS) and satisfaction with life domains (positive affect (PA) and negative affect (NA)). Initially, job satisfaction was included as part of the LS component, but later researchers (Dong & Yan, 2022) suggested that job satisfaction should be considered as a separate component of the SWB model.

Dong & Yan (2022) proposed that employee well-being or SWB (subjective well-being) should be viewed in terms of four main elements: the presence of a positive effect, the absence of a negative effect, life satisfaction, and job satisfaction. Briefly, the authors suggest assessing the positive and negative affect separately and provide three major scales for measuring emotions: positive and Negative Affect Schedule (PANAS) (Watson et al., 1988), Swedish Core Affect Scale (SCAS) by Västfjäll et al., 2002, and the Scale of Positive and Negative Experience (SPANE) created by Diener et al. (2010) (Dong & Yan, 2022). Regarding life satisfaction,

individuals may evaluate their life quality from satisfied to dissatisfied (Diener et al., 2009). It can be measured by the Satisfaction with Life Scale (SWLS), which was introduced by Diener et al. in 1985.

Job satisfaction is a multidimensional construct with various definitions in the literature. For this study, we adopt Locke's (1969) definition that characterizes job satisfaction as an emotional state arising from the evaluation of one's job in relation to their expectations and perceptions. This definition was selected because it acknowledges that job satisfaction is a multidimensional construct that can be influenced by job-related factors and employees' expectations and perceptions.

Job satisfaction is influenced by a variety of related job factors, such as individual's loyalty to the company (Aydogdu & Asikgil, 2011), experience (Cano & Miller, 2005), age, and gender (Kaya, 1995; Clark, 1997), education (Andres & Grayson, 2002).

2.2 Impact of COVID-19 on the job satisfaction of employees

2.2.1 Effect of COVID-19 on the job satisfaction of high COVID-19 risk employees

Literature and public organizations generally identify six groups of high COVID-19 risk professions. HCWs include doctors, nurses, and other healthcare professionals who may be at increased risk of exposure to COVID-19 due to their close contact with infected patients (Lilja et al., 2022; Barili et al., 2022). First responders include police officers, firefighters, and emergency medical personnel who may be at increased risk of exposure to COVID-19 when responding to emergencies (ILO, 2020). Service industry workers with customer-facing jobs include retail workers, restaurant workers, and other service industry professionals who may be at increased risk of exposure to COVID-19 due to frequent contact with the public (Wei et al., 2022). Fourth, transportation workers - such as bus drivers, taxi drivers, and other transportation professionals, may be at increased risk of exposure to COVID-19 due to their close contact with passengers (Heinzerling et al., 2022). Cleaning, sanitation workers, and caregivers: This includes janitors and other cleaning and sanitation professionals who may be at increased risk of exposure to COVID-19 due to their close contact with contaminated surfaces (Ng et al., 2022; ILO, 2020).

HCWs were found to be negatively affected by the pandemic. Researchers found that HCWs experienced a significant increase in workload, emotional distress, and the risk of infection; all of those factors contributed to decreased job satisfaction (Lai et al., 2020; Shanafelt et al., 2020). That group of workers experienced strain and stress (Lilja et al., 2022), and increased the prevalence of burnout by up to 80% (Morgantini et al., 2020).

First responders suffered increased stress levels due to apprehension about potential exposure to the virus during emergency interventions, as well as worries regarding the transmission of the virus (McAlearney et al., 2022). Meanwhile, service industry workers reported job insecurity and fear of job loss (Rosemberg et al., 2022). In contrast, less is known about the experiences of transportation workers. However, the study indicates concerns about the COVID-19 risk of infection, particularly since some passengers were not wearing masks. In addition, they found that special policies oriented toward risk mitigation had a negative effect on employees' morale and well-being (Gartland et al., 2022). Finally, cleaning and sanitation workers in low-middle-income countries reported having to work longer hours and also faced issues with irregular payments (Patwary et al., 2021).

2.2.2 Effect of COVID-19 on the job satisfaction of low and moderate COVID-19 risk employees

The COVID-19 pandemic has led to a substantial shift in the workplace, with a marked increase in remote work arrangements (Aksoy et al., 2022). This change has positively affected job satisfaction for a certain group of employees. The transition to remote work has reduced time spent commuting, allowing individuals to allocate more time to family and leisure activities, which in turn has contributed to an improved work-life balance (Gajendran & Harrison, 2007; Laß & Wooden, 2023).

Furthermore, working from home has provided employees with a more flexible and less stressful work environment, which has been shown to positively impact job satisfaction (Laß et al., 2023; Felstead & Henseke, 2017). Furthermore, employees who work remotely have reported increased autonomy and a greater sense of control over their work, which has contributed to higher levels of job satisfaction (Bailey & Kurland, 2002; Golden et al., 2006). Additionally, remote work arrangements have enabled better integration of personal and professional life, resulting in increased job satisfaction, and reduced work-related stress (Hill et al., 2003; Kossek et al., 2006).

2.3 The Job Demands-Resources (JD-R) model

The Job Demands-Resources (JD-R) model is a general model of employee well-being, developed by Bakker and Demerouti in 2007 (Appendix 1, Figure 3), which groups factors for job stress into job demands and job resources.

Job demands are elements requiring a high effort from the employee, such as physical and psychological requirements. In contrast, job resources are components of a job that are useful in reaching professional objectives, reducing the physiological and psychological costs of

the job demands, and encouraging personal development, learning, and growth. (Bakker & Demerouti, 2007).

Bakker & Demerouti, 2007 make a distinction between two psychological processes that can lead to strain and motivation. They contend that inadequate job design or chronic jobs can deplete employees' mental and physical resources, resulting in exhaustion and health problems (Demerouti et al., 2000, 2001a, b; Leiter, 1993).

The second psychological process described by Bakker & Demerouti is about job resources playing a key role in motivating employees and increasing work engagement and performance. These resources can have both intrinsic and extrinsic motivational effects by promoting learning, development, and achieving work objectives. The JD-R model suggests that the interaction between job demands and resources affects job strain and motivation, with high autonomy serving as a buffer against job stress. When job demands are high, the influence of job resources on work engagement and motivation is crucial, especially in the context of the COVID-19 pandemic.

Employing the JD-R model for the assessment of COVID-19 impact has been a conventional framework in many studies (Abdelsadig et al.,2022; Moreno-Jiménez et al., 2021; Giusino et al., 2022; Kaiser et al., 2020; Britt et al., 2021; Van Elk et al., 2022; Yildiz et al., 2022; Zhou et al., 2022).

2.4 Hypothesis development

2.4.1 COVID-19 & job satisfaction

During the COVID-19 pandemic, low COVID-19 risk workers, such as those in professions with lower exposure to the virus or those working remotely, may have experienced an increase in job resources, such as increased flexibility, autonomy, and work-life balance, particularly for those working remotely (Toscano et al., 2022).

The JD-R model suggests that a balance or surplus of job resources relative to job demands can positively impact job satisfaction (Bakker & Demerouti, 2007). For low COVID-19 risk workers, the COVID-19 pandemic may have led to a more favorable balance between job demands and resources, resulting in a stable or even increased level of job satisfaction.

The opposite prediction applies to vulnerable workers, such as healthcare workers, firefighters, and emergency medical personnel, who faced unique challenges during the COVID-19 pandemic. These workers encountered increased job demands, including exposure to the virus, the need for adaptability, and unconventional approaches to perform their tasks in the face

of rapidly changing conditions, at the same time, necessary resources to cope were insufficient (Cabarkapa et al., 2020).

Hence, we propose the following:

H1a: *The probability of being satisfied with the job decreased among high COVID-19 risk groups during COVID-19 (2020 year).*

H1b *The probability of being satisfied with the job increased among low and moderate COVID-19 risk workers during COVID-19 (2020 year).*

2.4.2 COVID-19 & satisfaction with working conditions

As we already mentioned, working conditions for low COVID-19 risk workers either did not change much or even became better, especially for employees working remotely. For example, many employees experienced a reduction in time spent commuting, which freed up time for family and leisure pursuits (Gajendran & Harrison, 2007; Laß & Wooden, 2023).

At the same time, vulnerable workers faced the risk of COVID-19 infection, and a new stress factor was the fear of being infected and subsequently infecting family or friends (Zhou et al., 2022; Ibrahim et al., 2022).

Hence, we propose the following hypothesis:

H2a: *The probability of satisfaction with working conditions decreased among high COVID-19 risk workers during COVID-19 (2020 year).*

H2b: *The probability of satisfaction with working conditions increased among low and moderate COVID-19 risk workers during COVID-19 (2020 year).*

2.4.3 COVID-19 & satisfaction with growth opportunities

On the one hand, the pandemic has accelerated the adoption of digital technologies. Workers may have had more opportunities for growth in developing new digital skills, adapting to online service delivery, and exploring new roles in their organizations (Nicola et al., 2020).

However, at the same time, growth opportunities could have been undermined by the economic contraction of the Russian economy, that contracted by 3% in 2020 due to the pandemic (TASS, 2021) as well as unemployment which increased during the pandemic, reaching 6.4% in September 2020, compared to 4.9% in January 2020 (Rosstat, 2023). Hence, we argue that the effect of COVID-19 on growth opportunities does not vary significantly if we compare low and high COVID-19 risk groups.

H3: *The probability of satisfaction with growth opportunities increased for low, moderate, and high COVID-19 employees during COVID-19 (2020 year).*

2.4.4 COVID-19& satisfaction with pay

Some categories of HCW regulated by resolution of the Government of the Russian Federation of October 30, 2020, No. 1762, and employees of social institutions - nursing homes for the elderly and people with disabilities (TASS, 2020) received monetary compensation for working with the close contact with COVID-19.

Although the existing literature did not explore the effect of COVID-19 on satisfaction with pay by risk groups, a study by Frutos-Bencze et al., 2022 indicated that satisfaction with pay increased in 2021 in both men and women. Hence, we propose the following:

H4: *The probability of satisfaction with pay increased for low, moderate, and high COVID-19 risk workers during COVID-19 (2020 year).*

3 Methods and data

3.1 Research design

To answer address question, secondary data analysis has been employed, using data from the Russia Longitudinal Monitoring Survey (RLMS-HSE) collected in 2019 and 2020 (National Research University "Higher School of Economics" et al., 2019, 2020). Detailed data description is provided in a corresponding subsection. The research design implied utilizing a Heckman probit model. This design allows for evaluating the effect of COVID-19 by comparing changes in the probabilities to be satisfied with the jobs while controlling for COVID-19 risk before and during the first year of the pandemic. The connection between this research design and the theoretical foundation is in the ability of the Heckman probit model to produce accurate estimates of changes in the probability of job satisfaction, taking into account the potential sample selection bias, thus providing empirical evidence to support or fail to support theoretical hypotheses on the impact of COVID-19 on job satisfaction.

3.2 Justification of the methodology

The choice of the probit model is justified by existing research on job satisfaction, where probit models were used (Rayton, 2006; Park, 2022; Kwon et al., 2019). The model specification stems from the hypotheses to be tested and the JD-R model. The choice of methodology is supported by the work of Ai and Norton (2003), who argue that in many empirical economic applications, the simple cross difference or derivative in nonlinear models with interaction terms can be directly interpreted as the parameter of interest. The use of a probit model is appropriate for our binary outcome variables, which measure different dimensions of job satisfaction, such as satisfaction with the job in general, working conditions, growth opportunities, and pay.

The Heckman two-step correction is used in order to overcome the potential selection bias. Since respondents' active working status is not random, the missing values for job satisfaction are not random, which requires model evaluation using the Heckman method (Heckman, 1974, 1976). The Heckman model helps address potential sample selection bias that occurs when values of the dependent variable are missing because of another process (Greene, 2011). Using non-random samples for testing statistical relationships can lead to sample selection bias, resulting in biased conclusions that negatively affect decision-making (Certo et al., 2015).

To address the sample endogeneity problem, the Heckman probit model is employed. In the first stage, the Probit model is used to estimate the probability of an individual participating in the labor force (selection equation). In the second stage, the model estimates the probability of job satisfaction, conditional on participating in the labor force (outcome equation). The selection

equation is used to obtain the Inverse Mills ratio, which is then included in the outcome equation to correct for potential sample selection bias (Certo et al., 2015).

Using the Heckman probit model, this study aims to provide unbiased estimates of the changes in the probability of job satisfaction among high and low COVID-19 risk groups while accounting for the non-random missing values due to non-working status.

3.3 Data description

In this study, the data RLMS-HSE from 2019 to 2020 is used. The advantages of RLMS-HSE data for the objectives of the study are their representativeness for the Russian population as well as the panel nature of the data. The data was collected using annual nationwide representative surveys (questionnaire) and probability stratified multistage area sampling.

As can be seen from Table 1, the data contains respondents who were not working at the moment of the survey. Therefore, the variable reflecting the active working status "You are currently working" was created and used in the Heckman probit model selection equation. In addition, respondents under 18 were deleted from the sample since this study focuses only on adult employees.

		YEAR		
		2019	2020	Total
CURRENT WORK STATUS	You are currently working	7 575	7 258	14 883
	You are on paid leave: maternity leave or taking care of a child under 3 years old	242	226	468
	You are on another kind of paid leave	18	31	49
	You are on unpaid leave	2	6	8
	You are not working	6 178	6 258	12 436
	Total	14 015	13 779	27 794

Table 1 Frequency table of respondents' work status (RLMS-HSE, 2019-2020)

3.4 Methods, procedures, and software

3.4.1 The Heckman probit model

This model was introduced by Van de Ven and Van Pragg (1981) and it allows to control for sample selection bias and estimate probit models.

The first stage of Heckman probit model (selection equation) is used to estimate the probability of being included in the sample:

$$Y1_j = 1 \text{ if } Z_j\gamma + u_{1j} > 0 \text{ (1)}$$

$Y1_j$ - the dependent variable, takes a value of 1 for employed respondents (active working status) and 0 for unemployed or not working (not active working status);

Z_j - a vector of independent variables for an individual j;

γ - a vector of parameters to be estimated.

In the second stage, outcome equation is estimated to predict job satisfaction:

$$Y2_j = 1 \text{ if } X_j\beta + \lambda\rho\sigma + u_{2j} > 0 \quad (2)$$

$$\text{Otherwise } Y2_j = 0$$

$$u_1 \sim N(0,1)$$

$$u_2 \sim N(0,1)$$

$$corr(u_1, u_{2)} = \rho$$

$Y2_j$ - a binary variable indicating job satisfaction (1 satisfied, 0 for unsatisfied);

X_j - a vector of independent variables for individual j;

β - vector of parameters to be estimated;

λ - is the inverse Mills ratio computed from the first stage.

3.4.2 Variable transformations

The variable reflecting professions with high COVID-19 risk according to the literature was created. For that, the variable containing the code of profession (ILO2008) was utilized.

The variable for the industry classification was created by combining the original industry classification used in RLMS as well as OKVED 2 (Russian Classifier of Types of Economic Activity).

To obtain the COVID-19 risk group indicator, variables reflecting professions with high COVID-19 risk and reflecting remote work status were used. In the case where the respondent had been working remotely and did not belong to high COVID-19 risk professions, such respondent was placed into the “Low COVID-19 risk group”. If the respondent belonged to a high COVID-19 risk profession and did not work remotely, such respondent was placed into the “High COVID-19 risk group”. When the respondent did not belong to a high COVID-19 risk

profession and did not work remotely, such respondent was assigned to the "Moderate COVID-19 risk group".

3.4.3 Heckman probit model – outcome equation

3.4.3.1 Dependent variables

To measure job satisfaction, four variables were available in the data: satisfaction with job in general, satisfaction with working conditions, satisfaction with growth opportunities, and satisfaction with pay. Those variables were dichotomized from the Likert scale (1 to 5) according to a similar study of job satisfaction (Gallie et al., 2016). Then, corresponding binary variables were created by assigning a value of 0 to responses in the lower range of the Likert scale (1, 2, and 3) and 1 to responses in the higher range of the Likert scale (4 and 5). This way, the binary variables represent low satisfaction (0) and high satisfaction (1) for each dimension. This procedure was done for the simplicity of interpretation and the ability to employ a probit model which requires binary outcomes.

Satisfaction with the job in general, satisfaction with working conditions, satisfaction with growth opportunities, and satisfaction with pay have been commonly used as measures of job satisfaction in the literature (Clark & Oswald, 1996; Spector, 1997; Warr, 1999).

Table 2 displays the percentages of employees who reported being satisfied or not satisfied with their job, working conditions, growth opportunities, and pay for each year from 2019 to 2020.

For the low and moderate COVID-19 risk group, we observe that overall satisfaction with job and working conditions increased from 2019 to 2020. Conversely, in the high COVID-19 risk group, employees' satisfaction with the job and working conditions decreased. Additionally, we can see an increase in satisfaction with pay and growth opportunities in all groups compared to the non-pandemic period.

Variable name	Category	EMPLOYEE GROUP: Low COVID-19 risk group, Year		Moderate COVID-19 risk group, Year		High COVID-19 risk group, Year	
		2019	2020	2019	2020	2019	2020
Satisfaction with job in general	Not satisfied, %	24,66	19,91	30,85	27,18	29,89	30,28
	Satisfied, %	75,34	80,09	69,15	72,82	70,11	69,72
Satisfaction with working conditions	Not satisfied, %	21,42	20,20	31,83	28,93	28,85	31,06
	Satisfied, %	78,58	79,80	68,17	71,07	71,15	68,94
Satisfaction with growth opportunities	Not satisfied, %	37,57	31,89	46,71	42,89	48,79	43,74
	Satisfied, %	62,43	68,11	53,29	57,11	51,21	56,26
Satisfaction with pay	Not satisfied, %	54,15	51,18	63,82	61,36	69,62	63,69
	Satisfied, %	45,85	48,82	36,18	38,64	30,38	36,31

Table 2 Summary statistics of dependent variables across low, moderate, and high COVID-19 risk groups, values in percentages

3.4.3.2 Independent variables

The COVID-19 pandemic can be operationalized as a binary variable, where "0" represents the pre-pandemic period (2019) and "1" represents the first year of the pandemic period (2020). This variable will allow us to assess the impact of the pandemic on job satisfaction by comparing job satisfaction levels before and during the outbreak. Additionally, we will include an interaction term between the pandemic variable and the COVID-19 risk group indicator to capture the effect of the pandemic on the probability of job satisfaction among risk groups.

3.4.3.3 Control variables

The literature review has shown that job satisfaction can be affected by various individual factors. Hence, according to Becker (2005), such variables need to be included in the study.

Previous studies have found a relationship between age and job satisfaction, with older employees generally reporting higher satisfaction levels (Kaya, 1995; Clark, 1997). Hence, the age variable was included in the model.

Work experience has been found to influence job satisfaction, with more experienced workers often reporting higher levels of satisfaction (Cano & Miller, 2005). Experience is measured in years of work experience in the respondent's current occupation.

Income has been shown to influence job satisfaction, as higher income is often associated with increased satisfaction (Yang et al., 2008). Therefore, the variable controlling for the respondent's income for the last 30 days was included.

Marital status has been found to be associated with job satisfaction, with married individuals often reporting higher levels of satisfaction (Austrom et al., 2009). Hence, the variable controlling for marital status was controlled for.

Higher levels of education have been linked to increased job satisfaction, as more educated individuals may have better job opportunities and working conditions (Andres & Grayson, 2002). Therefore, the variable of the education category of the respondent was included. Education is measured on an ordinal scale, indicating the highest level of education attained, such as “Unfinished secondary education [7-8 grades] or lower”, “Secondary School Diploma”, “Vocational secondary education Diploma”, “Higher education Diploma and more."

Gender differences in job satisfaction have been observed in previous studies, with women sometimes reporting higher satisfaction levels than men (Clark, 1997). Hence, we need to control for gender.

There is a positive association between a safe climate at work and job satisfaction (Gyekye, 2005). Hence, we are controlling for the hazard on the job, which is equal to 1 if the respondent answered positively to the question "Is your job harmful (unhealthy) or dangerous."

Individual loyalty to the company can affect job satisfaction (Aydogdu & Asikgil, 2011). Individual loyalty is measured using the question, "Do you trust the leadership of your organization?". This variable was transformed from a 5-point Likert scale to a binary variable, with clearly positive responses "Fully trust" and "Rather trust" equal to 1 "Trusts the leadership of the organization" in the binary variable, other values equal to 0 in the binary variable.

Job insecurity, as found by Sverke et al., 2002 has adverse consequences for workers' attitudes, health, and behavioral relationship with the organization. We control for job insecurity with the question, "How much are you concerned about the possibility that you might lose or change your job?". Respondents who chose options “very concerned” and “concerned” are placed in the category “Concerned” and “Not concerned” otherwise.

Summary statistics of control variables are presented in Appendix 2.

3.4.4 Heckman probit model – selection equation

3.4.4.1 Justification of variables in the selection equation

In order to include relevant variables in the selection equation, we investigated the literature which discussed the determinants of labor force participation and used the Heckman model to assess labor force participation.

Following a similar study by Pastore, 2012 we include age and age squared term in the selection equation as a proxy of work experience since the hypothesized relationship is U-shaped. However, to avoid the multicollinearity which can be caused by adding the squared term, we will use centered age and centered age squared.

According to the study by Gitter, 1982, the level of education of the individual affects the marginal utility of work and hence, influences labor force participation, with higher levels of education increasing labor force participation. Therefore, we have to include this variable in the selection equation.

The same study showed that marital status is also one of the determinants of labor force participation, with males showing higher labor force participation when married. On the contrary, females have shown (Lari et al., 2022) that the absence of a husband is associated with higher women's employment. Similarly, Lee & Jang et al., 2008) found that married women are less likely to have an active working status than unmarried women. Therefore, we need to include an interaction term between gender and marital status since the literature suggests different effects of marriage on both gender participation rates.

Kömüryakan, 2021 argues that the age and number of children in the household significantly affect the decision of a woman to participate in the labor force. Thus, we need to add an interaction term between the number of children under 18 years old and gender in the selection equation.

Since we do not have access to the administrative data on respondents' health, according to Short et al., 2009 it is acceptable to use self-reported health data, especially for shorter recall periods. Hence, we will use the variable measured using the question “Any last health problems last 30 days?” and group respondents into two groups “No health problems last 30 days” and “Health problems last 30 days”.

Chronic diseases were shown to be negatively associated with labor force participation (Qiao et al., 2021). Therefore, in our selection equation, we are controlling for chronic heart, lung, and spinal diseases based on respondents' self-reporting.

Another aspect to be considered is disability status; Bliksvaer, 2018 argues that being disabled is negatively associated with labor participation. In the selection equation, we are controlling for the disability status, using the question "Are you assigned to a disability class?" and in case the response was positive, the disability group is reported. All respondents were grouped into 4 categories: "No disability", "First group", "Second group," and "Third group," with a higher group number indicating a higher degree of disability.

3.4.5 Procedures

Firstly, we estimated four separate probit models. Each model focused on a different dimension of job satisfaction: satisfaction with the job in general, satisfaction with working conditions, satisfaction with growth opportunities, and satisfaction with pay. The models included the main independent variable (COVID-19 pandemic), control variables, and an interaction term between the pandemic variable and the COVID-19 risk group variable. After that, multicollinearity checks were conducted, ensuring that there was no multicollinearity in our models.

Following the estimation of each probit model, we estimated the Heckman probit models, followed by computing contrasts of the marginal effects for the low, moderate and high COVID-19 risk groups to measure the impact of the COVID-19 pandemic on job satisfaction. To ensure the accuracy of our results, we calculated 95% confidence intervals for the estimated contrasts of marginal effects alongside with Wald Chi-Square test. Tests on the joint significance of the interaction term were conducted as well.

3.4.6 Software

To perform the data analysis, Stata 17 software was used. The software enables the estimation of the Heckman probit model using the command “heckprobit”, as well as the computation of marginal effects and statistical tests to assess the significance and robustness of the results.

4 Results

4.1 Probit models results

Table 9 (see Appendix 3) shows the estimation of probit equations. We will reserve a discussion of the interaction term of main interest (COVID-19 risk group # Year) for a subsequent section with marginal effects since coefficients from probit models on the interaction terms are not directly interpretable.

Addressing the age factor, we included both the centered age and its squared term in our models because age and age squared presented multicollinearity issues. The centered age variable sign was not significant in any model. However, the squared term was statistically significant, meaning there is a nonlinear relationship between age and job satisfaction.

Women had a higher probability of being satisfied with working conditions. However, gender did not appear to have a significant influence on overall job satisfaction, satisfaction with growth opportunities, or satisfaction with pay.

Concerning income, which had a significant positive sign in all models, we can say that as income increases, satisfaction with the job in general, working conditions, growth opportunities, and pay are growing as well.

Married respondents had a higher likelihood of being satisfied with the job in general, working conditions, growth opportunities, and pay.

Regarding the industry, we included it in our models to control for the potential influence of that variable. Among significant results, we observed that being a worker in "Agriculture, Forestry, Fishing, and Food Industry", "Manufacturing, Construction, and Infrastructure" had a significant negative effect on being satisfied with working conditions. On the other hand, working in "Extraction and Processing of Natural Resources" and "Healthcare" significantly positively affected the probability of being satisfied with the job in general. “Media, Publishing, and Environmental Services” workers were more likely to be satisfied with working conditions. Additionally, employees of "Education, Culture, and Sports" had a lower probability of being satisfied with pay.

Respondents who expressed concern about the chance of job loss were less likely to be satisfied with the job.

Regarding education, we found that compared to the reference group - respondents with unfinished secondary education, respondents with higher education showed a significantly higher probability of being satisfied with job satisfaction in general and being satisfied with working

conditions. Yet, we did not observe any significant effects of education on satisfaction with growth opportunities and pay.

To account for the potential influence of health risks associated with the COVID-19 pandemic on job satisfaction, we included the COVID-19 risk group in our models. Interestingly, being part of a moderate or high COVID-19 risk group was associated with a decrease in the probability of being satisfied with growth opportunities and pay.

We included the year 2020 as a factor to account for any potential time-specific influences on job satisfaction, particularly given the global changes brought on by the COVID-19 pandemic. The year 2020 had a positive, significant effect on the probability of being satisfied with job in general and satisfied with growth opportunities.

Trusting the leadership, being a proxy of job loyalty, showed a significant positive effect across all aspects of job satisfaction.

4.2 Heckman models results

4.2.1 Main equation

The results of Heckman probit models are presented in Table 10 (see Appendix 4)

Overall, most coefficients and their magnitude stayed the same except for some differences. Similarly to probit model, only satisfaction with working conditions showed to have an association with gender, with females being more likely to be satisfied with working conditions. The positive effect of income and being married was observed across all models as in probit models. Coefficients did not change significantly for such variables as gender, trust in the leadership of the organization, job hazard, work experience, and work experience squared.

Regarding differences, for example, Heckman probit model did not identify a significant effect of the "Manufacturing, Construction, and Infrastructure" industry on working conditions. Moreover, in addition to being less likely to be satisfied with pay, workers of “Education, Culture, and Sports” were less likely to be satisfied with working conditions. “Media, Publishing, and Environmental Services” employees, according to Heckman probit model, were more likely to be satisfied with both job in general and working conditions. Also, we observed a significant negative coefficient for the vocational secondary school diploma holders, which meant that those respondents were less likely to be satisfied with pay compared to the reference group. A significant effect of the Moderate and High COVID-19 risk groups disappeared for the satisfaction of pay.

4.2.2 Selection equation

The results of the selection equation are presented in the same Table 8. Most of the variables in the selection equation were found to be significant.

Respondents with higher levels of education were more likely to participate in the labor force, as well as married individuals. Respondents indicating either health problems in the last 30 days or a chronic heart disease or being assigned to the disability class were less likely to have an active work status. Yet, chronic lung and spinal disease did not have significant coefficients in our models.

Interaction terms included in the models allowed us to observe the following effects of gender: Married women and women with children under 18 years old were less likely to work compared to married men and men with children under 18 years old. Yet, the effect of gender alone was not significant.

4.3 Model diagnostics, test for joint significance of the interaction term

In the set of probit models, the number of observations ranged from 13,190 to 13,692, with the Wild Chi Square statistic being significant across all models, which indicates that variables collectively produce a significant effect on the dependent variable (see Table 8).

In the set of Heckman probit models, the number of observations varied from 20,072 to 20,465; since non-working respondents were considered in the selection equation, the number of selection observations ranged from 10,199 to 10,592. The Wald test of independent equation (with the null hypothesis that rho=0) indicated that for models 5,7,8, we reject the hypothesis that the correlation between errors in the outcome and selection equation is equal to 0. Hence, the sample selection bias appears to be present, and the usage of the Heckman probit model is justified. But for model 6 we fail to reject the hypothesis that rho=0, suggesting that there is not enough statistical evidence to conclude that there is a selection bias and Heckman probit model may not be needed in that case. At the same time, when checking for the strength of exclusion restrictions, according to Certo et al., 2015, by running a linear regression with exclusion restrictions as independent variables and work status as a dependent variable, the pseudo-R2 value obtained was 0.35. That suggests that the strength of exclusion restrictions was acceptable, and the potential cause of rho=0 in model 6 may lie in the misspecification of the outcome equation.

In addition, the test for joint significance of interaction coefficients indicated that interaction terms are jointly significant in each model at conventional levels (see Table 3).

Wald Chi-Square Test (joint significance of interaction coefficients)

Model name	Test information	
	Chi-square	Prob>chi2
Satisfaction with job in general, probit model	34.67	0.0000***
Satisfaction with job in general, heckman probit model	20.61	0.0010***
Satisfaction with working conditions, probit model	21.16	0.0008***
Satisfaction with working conditions, heckman probit model	17.01	0.0045***
Satisfaction with pay, probit model	30.68	0.0000***
Satisfaction with pay, heckman probit model	17.58	0.0035***
Satisfaction with job growth opportunities, probit model	57.47	0.0000***
Satisfaction with job growth opportunities, heckman probit model	37.62	0.0000***

Note: + p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Hypothesis:

1. Moderate COVID-19 risk group = 0
2. High COVID-19 risk group = 0
3. Year 2020 = 0
4. Moderate COVID-19 risk group x Year 2020 = 0
5. High COVID-19 risk group x Year 2020 = 0

Table 3 Wald Chi-Square Test (joint significance of interaction coefficients)

4.4 Marginal effects

In this subsection, we will employ the Wald Chi-Square test and perform contrasts of predictive margins, which show the difference (over the year) of the probability of aspects of job satisfaction by the COVID-19 risk group. That will help us to determine whether the probabilities of different aspects of job satisfaction changed before and during the pandemic across risk groups. Note that we will only consider Heckman probit models since their estimates are superior to probit in the presence of sample selection bias.

Dependent variable	Wald Chi-Square Test				Contrast of predictive margins		
	year@COVID-19 risk group	**df**	**chi2**	**P>chi2**	**Contrast**	**std. err.**	**[95% conf. interval]**
Satisfaction with job in general	(2020 vs 2019) Low COVID-19 risk group	1	5.35	0.0207	0.0519616	0.0224563	[0079481 - .0959751]
	(2020 vs 2019) Moderate COVID-19 risk group	1	10.58	0.0011	0.0253828	0.0078019	[.0100914 - .0406742]
	(2020 vs 2019) High COVID-19 risk group	1	1.82	0.1777	-0.0227809	0.0169007	[-.0559056 - .0103437]
	Joint	3	17.93	0.0005			
	year@COVID-19 risk group	**df**	**chi2**	**P>chi2**	**Contrast**	**std. err.**	**[95% conf. interval]**
Satisfaction with working conditions	(2020 vs 2019) Low COVID-19 risk group	1	0.7	0.403	0.0191826	0.0229386	[-.0257763 - .0641415]
	(2020 vs 2019) Moderate COVID-19 risk group	1	8.67	0.0032	0.0240122	0.008153	[.0080327 - .0399917]
	(2020 vs 2019) High COVID-19 risk group	1	4.51	0.0336	-0.0377598	0.0177729	[-.072594 - .0029257]
	Joint	3	13.92	0.003			
	year@COVID-19 risk group	**df**	**chi2**	**P>chi2**	**Contrast**	**std. err.**	**[95% conf. interval]**
Satisfaction with growth opportunities	(2020 vs 2019) Low COVID-19 risk group	1	5	0.0253	0.059973	0.0268205	[.0074058 - .1125402]
	(2020 vs 2019) Moderate COVID-19 risk group	1	10.3	0.0013	0.0285172	0.0088841	[.0111047 - .0459298]
	(2020 vs 2019) High COVID-19 risk group	1	1.71	0.191	0.0260625	0.0199318	[-.0130031 - .065128]
	Joint	3	17.56	0.0005			
	year@group_ind22	**df**	**chi2**	**P>chi2**	**Contrast**	**std. err.**	**[95% conf. interval]**
Satisfaction with pay	(2020 vs 2019) Low COVID-19 risk group	1	3.16	0.0753	0.0503663	0.0283151	[-.0051303 - .105863]
	(2020 vs 2019) Moderate COVID-19 risk group	1	5.32	0.021	0.0210205	0.0091111	[.003163 - .038878]
	(2020 vs 2019) High COVID-19 risk group	1	1.75	0.1864	0.026829	0.0203066	[-.0129712 - .0666292]
	Joint	3	10.57	0.0143			

Table 4 Wald Chi-Square test, contrasts of predictive margins

Considering satisfaction with job in general, marginal effects revealed that Low and Moderate COVID-19 risk groups in 2019 were more likely to be satisfied with job in general in 2020 by 5.2 and 2.5 percentage points, respectively. However, even though High COVID-19 risk

employees were less likely to be satisfied with job in general in the year 2020, the effect was not significant at conventional levels (see Table 4).

Proceeding with satisfaction with working conditions, all other factors being equal, an individual from the Moderate COVID-19 risk group will be 2.4 percentage points more likely to be satisfied with working conditions in 2020. By contrast, in 2020, respondents from the High COVID-19 risk group, holding other factors constant, will be 3.8 percentage points less likely to be satisfied with job working conditions.

As for satisfaction with growth opportunities, the Low and Moderate COVID-19 risk groups were more likely to be satisfied in 2020 by 6.0 and 2.9 percentage points, respectively. The contrast of predictive margins for the High COVID-19 risk group was not significant.

For satisfaction with pay, the only significant contrast was found for Moderate COVID-19 risk, 2.1 percentage points.

5 Discussion

5.1 Primary results, interpretation, and hypotheses results

The aim of this research was to investigate the impact of the COVID-19 pandemic on various aspects of job satisfaction. The results provide important implications of how the COVID-19 pandemic effect differed for high, moderate, and low COVID-19 risk employee groups. The results of our hypotheses are summarized in Table 5.

Hypothesis	Result
H1a	Fail to support
H1b	Supported
H2a	Supported
H2b	Partially supported
H3	Partially supported
H4	Partially supported

Table 5 Hypotheses results

The primary results showed a significant increase in the probability of being satisfied with job in general for the Low and Moderate COVID-19 risk employees group in the year 2020. This suggests that there is a positive association between COVID-19 and job satisfaction in general for those groups. This result aligns with previous study, where authors found an increased level of job satisfaction in the pandemic. Researchers explained it by the organizations and government responses to the pandemic (Frutos-Bencze et al., 2022).

In our analysis, we did not observe a significant decrease in overall job satisfaction for the High COVID-19 risk group. This result is unexpected, given prior research, which suggested that employees in high-risk sectors like healthcare or essential services experienced elevated stress levels and, subsequently, diminished job satisfaction during the pandemic (Lai et al., 2020; Tan et al., 2020). A possible explanation could be the concept of psychological capital. Essential workers might have adapted to the circumstances, with their psychological resilience buffering the effects of stress on job satisfaction (Caponnetto et al., 2022). As such, we fail to support Hypothesis H1a, while Hypothesis H1b is supported.

Our analysis also reveals a significant increase in satisfaction with working conditions for the Moderate COVID-19 risk group in 2020, at a 95% confidence level. In contrast, the High COVID-19 risk group demonstrated a lower likelihood of job satisfaction in 2020. This aligns with earlier research that highlighted increased anxiety around workplace safety and dissatisfaction with working conditions, particularly for those in high-risk occupations (Chirico et al., 2020). Consequently, Hypothesis H2a is supported, and Hypothesis H2b is partially supported.

We observed that both Low and Moderate COVID-19 risk groups were more likely to express satisfaction with growth opportunities in 2020. This supports previous studies that suggested the rapid adoption of digital technologies during the pandemic provided workers with increased opportunities for growth, from developing new digital skills to adapting to online service delivery and exploring new roles within their organizations (Nicola et al., 2020). However, we did not detect a significant effect for High COVID-19 risk groups. This could be attributed to the wider confidence interval due to the relatively small sample size or potentially unaccounted factors influencing the probability of satisfaction with growth opportunities in the High COVID-19 risk group. Therefore, Hypothesis H3 is partially supported.

Finally, we found a significant positive contrast for the Moderate COVID-19 risk group in terms of satisfaction with pay. This could potentially be due to the reduction in working hours during 2020, which may have influenced this group's perceptions of pay satisfaction. However, at present, no research has explicitly explored this relationship. Thus, Hypothesis H4 is partially supported.

5.2 Interpretation of results based on the JD-R model

The JD-R model provides a useful framework for understanding our results in the context of the COVID-19 pandemic. This model emphasizes the balance between job demands and resources, which can strongly influence job satisfaction and other work-related outcomes.

In the case of the Moderate COVID-19 risk group, our results reveal a rise in job satisfaction. This aligns well with the JD-R model, where a beneficial balance between job demands (for example, work hours) and resources (for example, flexibility) can lead to a higher level of satisfaction. The unique pandemic circumstances might have created a favorable balance for this group, potentially explaining our findings.

However, our study did not observe a significant drop in job satisfaction in general for the High COVID-19 risk group. This result seems to contradict the JD-R model, where increased job demands related to high-risk environments should result in lower satisfaction. This unexpected

result could indicate that these workers had enough job resources to overcome the extra demands or that other factors, such as psychological resilience, played a significant role.

Our study also found varying satisfaction levels with working conditions among different risk groups. The Moderate COVID-19 risk group saw an increase in satisfaction, which is supported by the JD-R model. It is possible that job resources, such as reduced commuting or increased autonomy from remote work, outweighed the demands for this group. However, for the High COVID-19 risk group, we found a lower probability of satisfaction with working conditions, which is consistent with the JD-R model. This group likely faced increased job demands, such as an increased risk of infection, that surpassed their available resources.

Regarding growth opportunities, our findings suggest an increase in satisfaction among the Low and Moderate COVID-19 risk groups. This could be due to increased job resources during the pandemic, like opportunities to develop digital skills. But we did not find a similar effect in the High COVID-19 risk group. It could be due to an imbalance between job demands and resources, as suggested by the JD-R model, or other factors, like the small sample size for this group.

Lastly, our results show a significant increase in satisfaction with pay among the Moderate COVID-19 risk group. This supports the JD-R model, as fair compensation is a vital job resource. The pandemic may have brought changes that improved this group's perceived fairness of compensation.

6 Conclusion

This study aimed to investigate the impact of COVID-19 on job satisfaction among low, moderate, and high COVID-19 risk groups, focusing on various aspects such as working conditions, growth opportunities, and pay satisfaction. We used Probit and Heckman probit, calculated contrasts of predicted margins, and carried out the Wald Chi-Square test.

Our findings affirm that workers with high COVID-19 risk experienced a decline in satisfaction with working conditions, while the Moderate COVID-19 risk group saw an increase in satisfaction with working conditions. This implies a negative COVID-19 effect on the working conditions satisfaction for more vulnerable workers. Additionally, we found that workers from lower-risk groups (Moderate and Low COVID-19 risk) were more likely to be satisfied with their job in general, growth opportunities, and pay (only the Moderate COVID-19 risk group).

Broadly, the main results of this study indicate that the COVID-19 pandemic has had a differential impact on job satisfaction in general and some of its dimensions across various worker groups. Specifically, high COVID-19 risk workers experienced a significant decline in satisfaction with working conditions compared to their moderate-risk counterparts. However, it is important to note that not all facets of job satisfaction were affected by COVID-19. These findings suggest that the pandemic has exacerbated disparities in job satisfaction, with the most adverse effects being felt by high-risk and vulnerable workers.

The study contributes to the research gap by examining job satisfaction disparities among vulnerable and non-vulnerable workers in Russia during the pandemic, expanding the focus beyond remote employees and developed economies by employing a Heckman probit model. By focusing on various dimensions of job satisfaction, such as working conditions, growth opportunities, and pay satisfaction, the research provides a more comprehensive understanding of the impact of COVID-19 on the Russian workforce.

Regarding the practical significance, the research highlights the existing differences in job satisfaction levels of high and low COVID-19 risk workers while also emphasizing the negative effect of the pandemic on the high COVID-19 risk workers. The importance of that problem lies in the following: low job satisfaction can lead to higher turnover rates, which is certainly not desirable, especially in the essential workers' group in the context of COVID-19. The results of the study can help policymakers and managers to create targeted support measures for high COVID-19 risk workers with a focus on improving working conditions, such as offering flexible work arrangements and ensuring access to necessary protective equipment.

The present study has a few limitations that should be acknowledged. First, the sample size of the vulnerable to COVID-19 group is relatively small, which could affect the precision and generalizability of the results. Second, the list of vulnerable to COVID-19 groups may not be exhaustive, and therefore some potentially relevant categories may have been overlooked. Lastly, the data used in this research is yearly, which may not capture fast-changing patterns of job satisfaction.

For future research, several improvements could be considered. To better understand the trends in job satisfaction, more previous years of data could be included in the model. Additionally, obtaining a larger sample size of vulnerable to COVID-19 groups could help to increase the robustness of the findings and decrease the confidence intervals. Finally, acquiring monthly data could enable researchers to track changes in satisfaction more precisely and capture short-term fluctuations related to the pandemic and its varying impacts over time.

As for future research directions, future research could explore other sectors and occupations, both within and outside the context of the COVID-19 pandemic. Additionally, monitoring job satisfaction over a longer period could reveal long-term trends and the potentially lasting effects of the pandemic on different groups of workers. This could provide important insights into the recovery process and strategies to improve job satisfaction and employee well-being in the future.

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8 Appendix 1

The Job Demands-Resources model

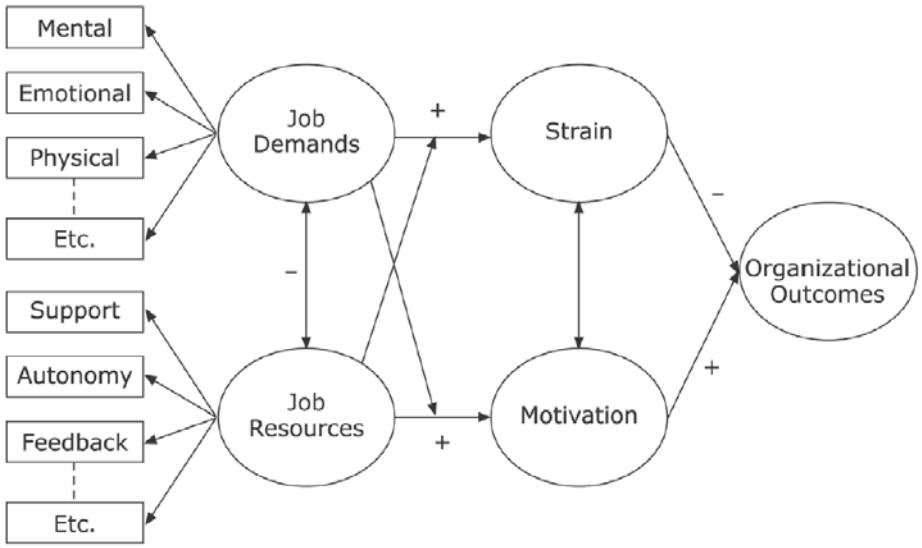

Figure 1 Job Demands-Resources (JD-R) model (Bakker & Demerouti, 2007)

9 Appendix 2

Summary statistics

	Employee COVID-19 risk group			
	Low risk group	Moderate risk group	High risk group	Chi-Square Test Significance
Marital status				
Not married, %	39,3	40,4	45,7	***
Married, %	60,7	59,6	54,3	
Completed education group				
Unfinished secondary education and lower, %	1,5	8,8	7,8	***
Secondary School Diploma, %	8,5	31,2	30,7	
Vocational secondary education Diploma, %	16,9	26	37,6	
Higher education Diploma and more, %	73,1	34	23,9	
Gender				
Male, %	33,4	52,8	36,2	***
Female, %	66,6	47,2	63,8	
Whether job has hazard				
The job does not have hazard, %	84,9	89,4	80,8	***
The job has hazard, %	15,1	10,6	19,2	
Trusts the leadership of the organization				
Does not trust the leadership of the organization, %	34,8	35,1	35,4	***
Trusts the leadership of the organization, %	65,2	64,9	64,6	
Industry				
Agriculture, Forestry, Fishing, and Food Industry, %	4,3	11,2	4,2	
Extraction and Processing of Natural Resources, %	2,4	8,4	1,3	
Manufacturing, Construction, and Infrastructure, %	8,5	18,3	2,5	
Transportation, Storage, and Communications, %	6,7	11,6	3,1	
Retail, Wholesale, and Consumer Services, %	20,1	19,3	32,4	
Financial, Real Estate, and Business Services, %	9,8	3,7	1,2	***
Public Administration, Defense, and Social Services, %	5,4	9,8	18,3	
Education, Culture, and Sports, %	37,5	12,9	7,3	
Healthcare, %	2,4	3,3	29,2	
Media, Publishing, and Environmental Services, %	1,4	0,5	0,3	
Other Services and Organizations, %	1,5	0,9	0,3	
Age				
Mean	41,7	41,7	43,3	
Standard deviation	11,4	11,5	12,8	X
Minimum value	19	18	18	
Maximum value	87	83	82	
Logarithm of income				
Mean	10,5	10,2	10,1	
Standard deviation	1,0	1,0	1,0	X
Minimum value	0	0	0	
Maximum value	14,7	14,8	12,7	
Experience				
Mean	10,3	9,1	9,2	
Standard deviation	9,6	8,7	8,9	X
Minimum value	1	0	1	
Maximum value	55	55	49	

Table 6 Summary statistics, control variables

10 Appendix 3

Probit models coefficients

	(1) Probit model	(2) Probit model	(3) Probit model	(4) Probit model
	Satisfaction with job in general	Satisfaction with working conditions	Satisfaction with growth opportunities	Satisfaction with pay
COVID-19 risk group: (reference group: Low COVID-19 risk group)				
Moderate COVID-19 risk group	-0.067	-0.113+	-0.166**	-0.121*
	(0.065)	(0.067)	(0.062)	(0.060)
High COVID-19 risk group	0.012	-0.009	-0.206**	-0.195**
	(0.078)	(0.079)	(0.074)	(0.073)
Year=2020	0.192*	0.059	0.193**	0.114+
	(0.078)	(0.081)	(0.073)	(0.069)
Moderate COVID-19 risk group # Year=2020	-0.080	0.028	-0.097	-0.048
	(0.083)	(0.085)	(0.077)	(0.073)
High COVID-19 risk group # Year=2020	-0.232*	-0.144	-0.088	0.009
	(0.094)	(0.096)	(0.088)	(0.085)
Age centered divided by 100	-0.185	-0.170	0.044	-0.108
	(0.149)	(0.147)	(0.151)	(0.141)
Age centered squared divided by 100	0.031***	0.029***	0.020*	0.040***
	(0.009)	(0.009)	(0.009)	(0.008)
Gender: (reference group: Male)				
Female	-0.035	0.069*	0.026	-0.025
	(0.030)	(0.030)	(0.029)	(0.030)
Logarithm of income	0.129***	0.075***	0.078***	0.214***
	(0.015)	(0.013)	(0.015)	(0.032)
Married	0.094***	0.107***	0.112***	0.065*
	(0.028)	(0.028)	(0.027)	(0.027)
Industry: (reference group: Retail, Wholesale, and Consumer Service)				
Agriculture, Forestry, Fishing, and Food Industry	-0.083+	-0.198***	0.031	0.018
	(0.050)	(0.050)	(0.049)	(0.050)
Extraction and Processing of Natural Resources	0.119*	-0.084	0.066	0.020
	(0.060)	(0.058)	(0.058)	(0.057)
Manufacturing, Construction, and Infrastructure	-0.038	-0.152***	-0.017	-0.039
	(0.045)	(0.045)	(0.045)	(0.045)

Transportation, Storage, and Communications	-0.002	-0.093+	-0.015	0.015
	(0.051)	(0.050)	(0.049)	(0.049)
Financial, Real Estate, and Business Services	0.013	0.118	0.061	0.079
	(0.073)	(0.077)	(0.071)	(0.068)
Public Administration, Defense, and Social Services	0.023	0.017	0.053	0.028
	(0.052)	(0.052)	(0.049)	(0.049)
Education, Culture, and Sports	0.064	0.083+	0.046	-0.129**
	(0.048)	(0.048)	(0.046)	(0.045)
Healthcare	0.125*	0.016	0.065	-0.060
	(0.062)	(0.061)	(0.059)	(0.058)
Media, Publishing, and Environmental Services	0.449+	0.500*	0.127	-0.087
	(0.232)	(0.228)	(0.164)	(0.165)
Other Services and Organizations	0.184	0.205	0.192	0.264*
	(0.142)	(0.151)	(0.139)	(0.134)
Concerned about the chance of job loss	0.010	-0.008	0.011	-0.153***
	(0.026)	(0.026)	(0.025)	(0.025)
Education: (reference group: Unfinished secondary education [7-8 grades of school] and lower)				
Secondary School Diploma	-0.001	0.057	-0.050	-0.105*
	(0.050)	(0.049)	(0.050)	(0.051)
Vocational secondary education Diploma	0.085+	0.227***	0.057	-0.071
	(0.052)	(0.051)	(0.052)	(0.052)
Higher education Diploma and more	0.150**	0.329***	0.025	0.065
	(0.052)	(0.051)	(0.052)	(0.053)
Trusts the leadership of the organization	0.747***	0.720***	0.639***	0.519***
	(0.026)	(0.026)	(0.026)	(0.026)
The job has a hazard	-0.148***	-0.321***	0.047	0.060
	(0.042)	(0.042)	(0.040)	(0.040)
Work experience in years	0.014**	0.008+	0.015***	-0.004
	(0.004)	(0.004)	(0.004)	(0.004)
Work experience in years squared	-0.000	0.000	-0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.479***	-0.941***	-1.255***	-2.779***
	(0.182)	(0.161)	(0.176)	(0.348)

Number of observations	13,692	13,688	13,190	13,633
Wald test of joint significance:	1,162	1,250	931	695
Wald chi2				
Prob>chi2	0.000	0.000	0.000	0.000
AIC	15,064	15,162	17,026	16,933
BIC	15,283	15,381	17,243	17,151

Clustered standard errors in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 7 Coefficients of probit models

11 Appendix 4

Heckman models coefficients

	(5) Heckman probit model Satisfaction with job in general	(6) Heckman probit model Satisfaction with working conditions	(7) Heckman probit model Satisfaction with growth opportunities	(8) Heckman probit model Satisfaction with pay
COVID-19 risk group: (reference group: Low COVID-19 risk group)				
Moderate COVID-19 risk group	-0.016	-0.078	-0.165*	-0.087
	(0.072)	(0.075)	(0.069)	(0.067)
High COVID-19 risk group	0.088	0.071	-0.191*	-0.124
	(0.086)	(0.089)	(0.083)	(0.083)
Year=2020	0.203*	0.075	0.185*	0.135+
	(0.087)	(0.090)	(0.082)	(0.076)
Moderate COVID-19 risk group # Year=2020	-0.115	0.004	-0.106	-0.077
	(0.091)	(0.094)	(0.087)	(0.081)
High COVID-19 risk group # Year=2020	-0.281**	-0.202+	-0.112	-0.060
	(0.105)	(0.108)	(0.099)	(0.095)
Age centered divided by 100	0.373	0.236	0.706**	0.046+
	(0.267)	(0.284)	(0.265)	(0.238)
Age centered squared divided by 100	0.073***	0.052**	0.050**	0.049**
	(0.019)	(0.020)	(0.019)	(0.017)
Gender: (reference group: Male)				
Female	0.048	0.131**	0.078+	0.053
	(0.043)	(0.042)	(0.042)	(0.041)
Logarithm of income	0.146***	0.090***	0.105***	0.287***
	(0.020)	(0.017)	(0.019)	(0.048)
Married	0.095**	0.136***	0.127***	0.093**
	(0.034)	(0.034)	(0.033)	(0.033)
Industry: (reference group: Retail, Wholesale, and Consumer Service)				
Agriculture, Forestry, Fishing, and Food Industry	-0.067	-0.163**	0.069	0.024
	(0.057)	(0.057)	(0.056)	(0.058)
Extraction and Processing of Natural Resources	0.175*	0.016	0.079	0.021
	(0.068)	(0.066)	(0.065)	(0.064)
Manufacturing, Construction, and Infrastructure	0.024	-0.097+	-0.022	-0.048
	(0.052)	(0.052)	(0.051)	(0.052)

Transportation, Storage, and Communications	0.007	-0.066	-0.034	0.006
	(0.059)	(0.057)	(0.056)	(0.057)
Financial, Real Estate, and Business Services	0.072	0.178+	0.027	0.038
	(0.085)	(0.092)	(0.083)	(0.079)
Public Administration, Defense, and Social Services	0.043	0.051	0.055	0.030
	(0.058)	(0.059)	(0.056)	(0.056)
Education, Culture, and Sports	0.087	0.126*	0.047	-0.152**
	(0.053)	(0.053)	(0.051)	(0.052)
Healthcare	0.132+	0.067	0.089	-0.084
	(0.068)	(0.069)	(0.066)	(0.066)
Media, Publishing, and Environmental Services	0.605*	0.550*	0.159	-0.112
	(0.262)	(0.245)	(0.180)	(0.178)
Other Services and Organizations	0.217	0.178	0.031	0.184
	(0.163)	(0.175)	(0.152)	(0.153)
Concerned about the chance of job loss	0.017	-0.000	-0.013	-0.149***
	(0.030)	(0.029)	(0.028)	(0.028)
Education: (reference group: Unfinished secondary education [7-8 grades of school] and lower)				
Secondary School Diploma	-0.017	0.039	-0.102+	-0.132*
	(0.058)	(0.057)	(0.058)	(0.059)
Vocational secondary education Diploma	0.032	0.201**	-0.040	-0.162*
	(0.064)	(0.065)	(0.064)	(0.063)
Higher education Diploma and more	0.063	0.279***	-0.094	-0.007
	(0.067)	(0.068)	(0.065)	(0.065)
Trusts the leadership of the organization	0.750***	0.728***	0.626***	0.516***
	(0.030)	(0.029)	(0.030)	(0.030)
The job has a hazard	-0.180***	-0.358***	-0.017	0.033
	(0.046)	(0.046)	(0.045)	(0.045)
Work experience in years	0.011*	0.004	0.015**	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)
Work experience in years squared	-0.000	0.000	-0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-1.613***	-1.106***	-1.347***	-3.437***
	(0.246)	(0.211)	(0.233)	(0.524)
Selection equation				
Active work status				
Gender: (reference group: Male)				

Female	0.020	0.020	0.018	0.020
	(0.060)	(0.060)	(0.060)	(0.059)
Age centered	-0.044***	-0.044***	-0.046***	-0.044***
	(0.002)	(0.002)	(0.002)	(0.002)
Age centered squared	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)
Education: (reference group: Unfinished secondary education [7-8 grades of school] and lower)				
Secondary School Diploma	0.230***	0.228***	0.225***	0.229***
	(0.047)	(0.047)	(0.048)	(0.047)
Vocational secondary education Diploma	0.491***	0.487***	0.500***	0.488***
	(0.049)	(0.049)	(0.050)	(0.049)
Higher education Diploma and more	0.671***	0.670***	0.679***	0.672***
	(0.049)	(0.049)	(0.050)	(0.049)
Married	0.257***	0.257***	0.270***	0.259***
	(0.054)	(0.054)	(0.055)	(0.054)
Married # Female	-0.503***	-0.500***	-0.506***	-0.502***
	(0.065)	(0.065)	(0.066)	(0.065)
Health problems last 30 days	-0.136***	-0.133***	-0.138***	-0.132***
	(0.027)	(0.027)	(0.028)	(0.027)
Number of children under 18	-0.022	-0.021	-0.030	-0.023
	(0.029)	(0.030)	(0.030)	(0.029)
Female # Number of children under 18	-0.258***	-0.259***	-0.254***	-0.259***
	(0.031)	(0.031)	(0.032)	(0.031)
Disability class: (reference group: No disability)				
First group	-1.278***	-1.300***	-1.268***	-1.272***
	(0.238)	(0.238)	(0.238)	(0.241)
Second group	-1.247***	-1.254***	-1.291***	-1.256***
	(0.104)	(0.104)	(0.106)	(0.104)
Third group	-0.664***	-0.671***	-0.698***	-0.666***
	(0.094)	(0.094)	(0.092)	(0.094)
Chronic heart disease	-0.181***	-0.177***	-0.164***	-0.176***
	(0.045)	(0.045)	(0.046)	(0.045)
Chronic lung disease	-0.017	-0.017	0.001	-0.012
	(0.051)	(0.051)	(0.052)	(0.051)
Chronic spinal disease	-0.002	0.002	0.004	-0.000
	(0.033)	(0.033)	(0.034)	(0.033)
Constant	0.542***	0.541***	0.524***	0.539***

	(0.066)	(0.066)	(0.067)	(0.066)
/ athrho	-0.276*	-0.163	-0.251*	-0.202*
	(0.109)	(0.108)	(0.101)	(0.081)
Number of observations	20,465	20,459	20,072	20,427
Number of nonselected observations	9,873	9,873	9,873	9,873
Number of selected observations	10,592	10,586	10,199	10,554
Wald test of joint significance: Wald chi2	951	1,019	768	536
Prob>chi2	0.000	0.000	0.000	0.000
Wald test of independent equations: (rho=0): chi2(1)	6	2	6	6
Prob>chi2	0.012	0.130	0.013	0.013
AIC	29,847	29,940	30,822	31,201
BIC	30,227	30,320	31,201	31,581

Clustered standard errors in parentheses
+ p<0.10, * p<0.05, ** p<0.01, *** p<0.001

Table 8 Coefficients of Heckman models